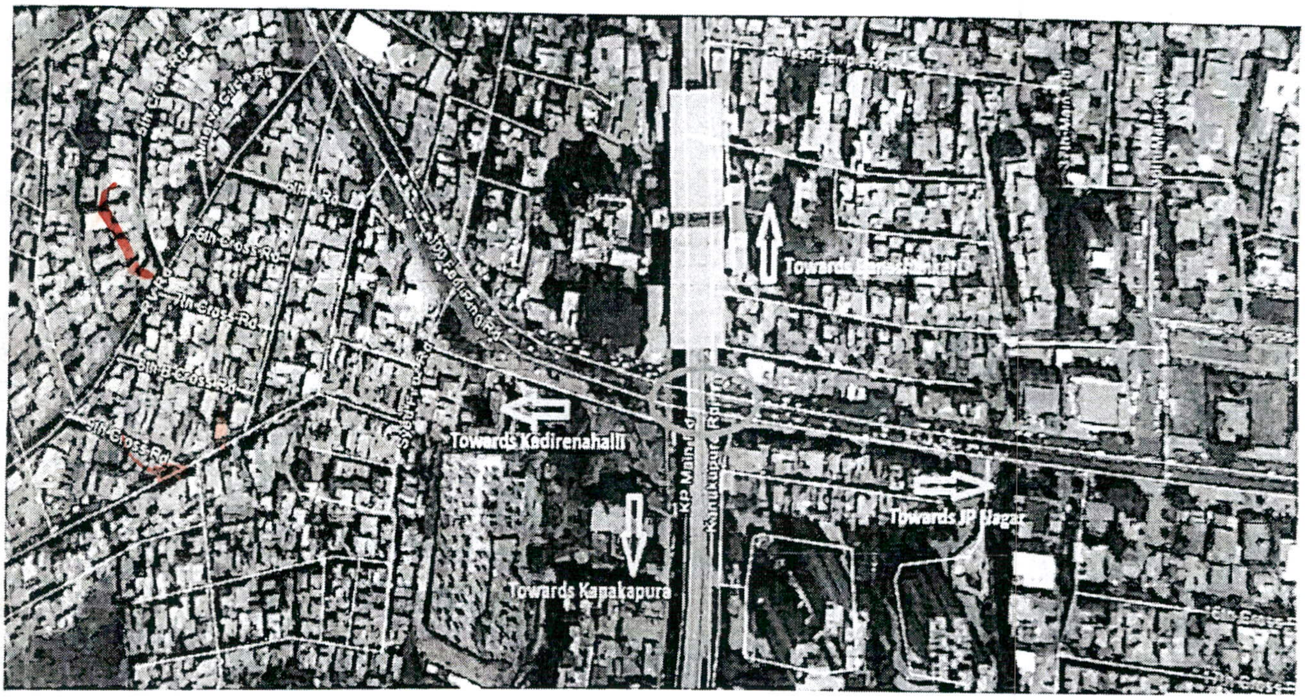
Bruhat Bengaluru Mahanagara Palike

BRUHAT BANGALORE MAHANAGARA PALIKE

CONSULTANCY SERVICES FOR PREPARATION OF FEASIBILITY REPORT AND DETAILED PROJECT REPORT (DPR) FOR THE WORK OF PROPOSED CONSTRUCTION OF FLYOVER ALONG ORR AT THE JUNCTION OF KANAKAPURA ROAD AND SARAKKI JUNCTION, BANGALORE



DETAILED PROJECT REPORT

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ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು
(ಯೋಜನೆ ಕೇಂದ್ರ-3)
ಬೃಹತ್ ಬೆಂಗಳೂರು ಮಹಾನಗರ ಪಾಲಿಕೆ

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CHAPTER -1 – INTRODUCTION

1.1 Back Ground.

1.1.1 Bangalore, the Capital of Karnataka is the Fifth Largest City in the Country and is growing at a rate, which is significantly higher than that of others. Due to the Growth in Economic Activities, the City is attracting migrants. To serve this Influx of Population, Residential Layouts are being developed. But adequate Transport Infrastructure Facilities such as Roads, Grade Separators, Subways, Mass Transit System, etc. to match this demand are conspicuously absent. The additional demand is to be catered by the already Saturated Road Network. Due to the Inherent Road Network in Bangalore, there are on the average 2 Major and 2 Minor Junctions per kilometre of Road Length. This has resulted in increase in Travel Time due to frequent Bottlenecks and Breakdowns.

1.1.2 The Urban Form of Bangalore is characterized by a Radio – Concentric System structured by Ring Roads, Five Major Radial Roads and Five Secondary Radial Roads. The Five Major Radial Roads are Mysore Road (SH – 17) in the South / South West, Old Madras Road (NH – 4) in the North / North East, Bellary Road in the North, Hosur Road (NH – 7) in the South – East and Tumkur Road in the North – West. Similarly, the Five Secondary Radial Roads include Magadi Road (SH – 17E) in the West, Kanakapura Road (NH – 209) in the South, Bannerghatta Road (SH – 48) in the South, Varthur Road and Whitefield Road (SH – 37) in the East. The differentiated development of the City based on Geographical Sectors and the Star like Growth Array along the Major Roads, mark the change from a Concentric Spatial Growth to a Sectorial and Linear Radial Development.

1.1.3 The City had a population of 84.42 Lakhs as per 2011 census. The extent of Developed Area has also increased considerably, in 1971 the Area was 174.7 Sq. km. and today it is about 800 Sq. km. In absence of Adequate Mass Transportation System, the use of personal motor vehicles for intra – city travel has increased substantially. This has resulted in growth of motor vehicles, which is four times the rate of population growth in the last two decades (1.91 Lakh vehicles in 1981 and 23 Lakh vehicles in 2005). The Public Transport System (Bus) is overstressed carrying about 50 Lakh Commuters in a daily basis. Congested Streets and Longer Route Length due to Urban Sprawl have only served to reduce Bus Frequencies further. In a recent study done by CRRI, it has been reported that annual traffic growth rates vary in the range of 2 – 4% in the central zone, 5 --7% in the intermediate zone and 8 – 9% on the regional roads in Bangalore City. CRRI study also reported delays of 26.8 sec per km of travel and 9.9 seconds per minute of travel.

1.1.4 The combined effect of all these on the Road Network of Bangalore is Delay and Congestion beyond Tolerable Limits. Vehicular Conflicts at the Intersections are being eliminated by Traffic Signals but at the Expense of Delays and Long Queues. The Peak Hour has spread over a longer period of time, since there are no Perceptible Capacity Augmentation / Conflict Reduction Measures. Traffic related Problems have become Regular Phenomena on Bangalore Roads, due to the Vast Developments. This fact is substantiated by the Traffic Study Results at various Road Networks and Intersections of the City. Most of the Major Junctions of the Core City have crossed the mark of 10000 PCUs in the Peak Hour. Though number of Grade Separators have been constructed and are being constructed, most of them are located in the Developed Part of the City and causing a Trigger of Congestion at adjacent Junctions. Traffic Management Measures such as One Way Systems, Parking Restrictions, Junctions Improvements, etc. are being implemented to ease the Congested Street Network. But the ever increasing Traffic is fast deteriorating the Limited Improvement in Level of Service these Traffic Management Measures can offer.

1.1.5 As a Comprehensive Development Programme for Improvement of Road Network, the Bruhat Bangalore Mahanagara Palike (BBMP) has planned Grade Separated Junction, Widening of Roads, Strengthening of Pavement Base and Sub – Base, Improvement to Pedestrian Facilities, Provision for Car Parking, etc. BBMP has constituted a separate cell to coordinate the Widening of Major Roads in Bangalore City in the face of Land

Acquisition Challenges. This Response is the Answer to the severe strain on the Urban Infrastructure, which is inevitable due to the very rapid rate of growth in traffic. Travel Demands of Passengers have increased many folds in the last two decades. Unfortunately, Growth in the Infrastructure is not commensurate with the growing demands of traffic. There is an exigent need to effectively manage the Traffic and Transportation Systems to optimize the Solutions with Short Term and Long Term Measures.

1.1.6 One of the Practical Steps towards Optimal Solutions that will also give an Immediate Relief to Traffic Scenario is Capacity Augmentation. Capacity Augmentation is not possible without widening the high – density corridors. Increasing the capacity of important corridors is inescapable in the long run even if it entails Land Acquisition at high cost. The Land Acquisition is proposed through a Process of Conferring Development Rights (Transfer of Development Rights), by which the owner of the land who has surrendered the part of the land towards infrastructure projects would be allowed to carry out construction based on enhanced Floor Space Index (FSI) conferred by the TDRs.

1.1.7 BBMP is already maintaining about 3500 Km. of road out of which 2820 Km. is asphalted surface, 129 Km. is of concrete surface, 476 Km. is of metalled surface and 75 Km. is of other surface. The annual expenditure on construction and strengthening has been increasing from Rs. 600 million in 2001 to Rs. 800 million in 2004.

1.1.8 Bangalore has 332 Km. of Arterial Roads, 210 Km. of Sub – Arterial Roads and 2958 Km. of Local and Feeder Roads. Several Corridors that carry traffic from the Hub of the City to other Parts of the City are being widened on fast track in a phased manner. In this regard, BBMP has taken a Proactive Approach and taken steps to widen Roads that cater to High Volume of Traffic.

The existing Road Network System of Bangalore is a major concern, both in terms of Conditions of Roads and the Structure of the Network. The Basic Structure is Radio – Concentric with about Ten Major Roads converging on the Centre. The Roads themselves are crowded and their Convergence creates Heavy Congestion.

1.2 Need for the Project:

Bruhath Bangalore Mahanagar Palike, the agency responsible for providing infrastructure facilities in the city, with the intention of improving road user facilities plans to decongest critical junctions by proposing Grade Separator Schemes.

The project under consideration is Sarakki Junction. The location being central part of the city, traffic flow in this corridor is from South Part of Bangalore towards North of Bangalore, Also the Present traffic flow pattern from other direction, i.e, East to West traffic from Bannerghatta to Mysore Road is such that, it has to go via Banashankari to reach southern parts i.e., JP Nagar, Kanakapura Road etc.,

The main junctions along this corridor are- Ilyas Nagar Junction, Sarakkki Junction, Sindhoor Choultry Junction, 35th Main Junction and 33rd Main Junctions. The travel speed of the vehicles throughout the day is 20-25 kmph with frequent jams.

The waiting time and queuing of vehicles during peak hours is high at these junctions. Pedestrian volume is also very high in the area because of commercial activities on the factors it is necessary to provide "Elevated Road" from Geological Survey Office Junction to JP nagar 33rd Main Junction which carries through traffic, thereby reducing the delay in travelling time, reduction of surface level traffic etc.,

To arrive at better picture about the present situation following studies are conducted –

- Topographical Survey.
- Traffic Studies.
- Geo Technical Investigations.

This report presents above studies, detailed specifications, Bill of quantities, estimates and recommendations to decongest the surface level traffic and improved travelling conditions from Kadirenahalli Junction to JP Nagar 33rd Main Junction.

Bruhath Bangalore Mahanagara Palike, the agency responsible for providing infrastructure facilities in the city, with the intention of improving road user facilities plans to decongest critical junctions by proposing Grade Separator Schemes.

Chapter – 2 – OBJECTIVE AND SCOPE OF STUDY

2.1 Objective

Detailed Project Report for the Construction of flyover along ORR at the junction of Kanakapura road and Sarakki junction, approved by M/s. BBMP, the reference for the present study.

The alignment and carriage width finalised in the "Feasibility Report" is considered for the following primary objectives of the study –

- To conduct investigations to study the approved alignment, for improvement of traffic movement along the proposed corridor.
- Suggest on optional and Feasible Structural System.
- Improve the existing junction to streamline traffic flow at grade level.
- Prepare cost estimate and bidding documents.

2.2 Project Scope

The scope of the consultancy study involves the following -

- Review of available data and reports
- Conduct necessary traffic survey and analysis of data.
- Conduct Geo-technical Investigations
- Finalisation of General Arrangement drawing for the proposed Grade Separator.
- Study of "Structural System" and Evaluation.
- Preparation of Traffic Management Data.
- Preparation of preliminary designs and estimates.
- Cost – Benefit Analysis
- Detailed Designs.
- Preparation of Tender documents.

On acceptance of the report preparation of tender documents are proposed to be prepared as part of the Consultancy Services.

2.3 Approach Methodology:

Stage - I **Field Investigation:**

i. Conducting Topo Survey

ii. Soil Investigation as per NIT.

iii. Conducting Traffic Survey as per NIT

iv. Identifying the utilities.

Stage - II **Detailed Analysis and Designs**

i. Detailed Soil investigation report as per field and lab tests.

ii. Preparation of GAD and discussing with the authorities for approval of the same.

iii. Detailed Analysis of Super Structure and sub structures.

iv. Design of Super Structure, Substructure and Foundation as per IRC Codes and specifications.

v. Preparation of Preliminary drawings.

vi. Environmental impact analysis.

vii. Preparation of detailed BOQ and cost estimates.

viii. Preparation of Tender documents.

2.4 Design Philosophy.

The Technical proposal given in this Feasibility Report consists of Designs, Drawings and all Technical Details based on Surveys and Investigations stated in Section 2.2 above.

The Design standards adopted in the present Design are in accordance with the codal provisions of India as stipulated by the Indian Roads Congress (IRC), Indian Standards Specification (IS) and the Ministry of Road Transport & Highways. Deviations may be considered in planning parameters if extremely necessary considering the dense urban conditions, like the present one, from the present codal provisions. These modifications in the design will be adopted based on similar projects at urban locations as "Good Engineering Practice".

The Designs and Drawings presented as a part of this report are based on the Studies, Investigations and Designs which provide a fair basis for making Detailed Designs and Drawings subsequently. The consultants opine that the detailed engineering designs and drawings will be prepared on approval of this report before construction, based on actual details at site viz., utilities, Geo Technical data and Soil profile etc.

2.5 Deliverables:

Following are proposed to be submitted as part of the Detailed Project Report -

- Topography Survey drawing of the study area.
- Surface level improvements.
- Layout drawing and typical details of "Structural System"
- Traffic Management Plan during construction.
- Cost Estimates including utility shifting.
- Tender Document.

Chapter – 3 – Project Cost

3.1 General

The estimates have been prepared based on PWD Schedule of rates 2018-19 & NH-SR schedule of rates 2018-19 with 8% area weight age considered for all items. However, items which are not covered under NH-SR, KPWD SR rates for Bangalore circle, market rates have been adopted.

For items such as Bitumen, Emulsion, Steel, Cement etc., latest Issue rate are adopted after carryout out rate analysis.

The detailed estimate is enclosed as **Appendix -1.** At the end of the report. The bill wise cost abstract for the project is shown in below –

3.2 Abstract Estimate

Sl. No.	Particulars	Cost in Rs. SR (18-19)
1	SITE CLEARANCE AND DISMANTLING	4,47,142.01
2	SURFACE LEVEL ROADS / SLIP ROADS	2,43,57,965.58
3	DRAIN & COMPOUND WALL WORKS	1,31,92,166.00
4	MEDIAN, KERB & PIER PROTECTION BELOW FLYOVER	1,32,17,232.24
5	ROAD FURNITURE & OTHER WORK	71,18,488.29
6	FLYOVER WORKS	69,92,14,624.81
7	FLYOVER APPROACH WORKS	3,95,68,259.07
8	DIVERSION ROAD	1,97,26,146.25
9	ELECTRICAL WORKS	77,37,245.00
10	OVERHEAD GANTRY	26,66,903.85
	Sub TOTAL(A)	**82,72,46,173.09**

11	Cost for Topographical Survey (B)	55,000.00
12	Cost for Soil Investigation (C)	28,50,000.00
	Sub Total 1 (A+B+C)	**83,01,51,173.09**
13	Design Charges @ 1% of Sub Total 1 (D)	83,01,511.73
	Sub Total 2 (A+B+C+D)	**83,84,52,684.82**
13	**Utility Shifting Charges**	
	A. Provision for BESCOM	8,53,49,076.77
	B. Provision for BWSSB	6,17,30,000.00
	Sub Total 3 (A+B+C+D+E) - (Tender Amount)	**98,55,31,761.59**
14	Goods and Service Tax (GST) @ 12% on Sub Total 2	10,06,14,322.18
15	Goods and Service Tax (GST) @ 18% on Utility Shifting Cost	2,64,74,233.82
	Sub Total 4 (A+B+C+D + E+F) - (Tender Amount + GST)	**1,11,26,20,317.59**
16	Cost of Consultancy Charges for DPR Preparation as per actual	23,75,000.00
17	Cost of Consultancy Charges for PMC and Quality Assurance Charges @ 1.5% of Civil Works Cost	1,24,08,692.60
18	Landscapping work -LS	50,00,000.00
	Sub Total 5 (Amount put to Tender + GST + Consultancy Charges)	**1,13,24,04,010.19**
19	Land Acquisition For an Area of 327.59 Sqm at Rs. 193283/- per Sqm [(Rs. 91171/- + 112% Solatium) per Sqm]	6,33,17,420.73
	Sub Total 6 (Sub Total 5 + Cost of Land Acquisition)	**1,19,57,21,430.91**
20	Miscellaneous and Rounding off	78,569.09
	Grand Total	**1,19,58,00,000.00**
	(Rupees One Hundred and Nineteen Crore and Fifty Eight lakhs Only)	

3.2 Land Acquisition:

To execute the work, it is requiring land and structure acquisition and cost of Rs.6.33Crores.

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Chapter – 4 – FIELD SURVEYS AND INVESTIGATION

4.1 General

In order to arrive at a feasible traffic improvement measure at Sarakki Junction, various field surveys and investigations were conducted in month of November 2019.

The Study and Investigations were in accordance with the Scope of Work entrusted to the Consultants. They include:

- Field Reconnaissance.
- Traffic Surveys.
- Topography Surveys.
- Soil Investigations / Borehole Investigations..

4.2 Site Appreciation

Outer Ring Road crosses the Kanakapura Road at Sarakkai junction which is 4 legged and 4 lane road having road width of varying from 17.08m to 22.64m. The Kanakapura Main road 4 lanes divided carriageway with median and having Metro Lane along Kanakapura Road at Median with having vertical height 13.5m and at present traffic are by automatic traffic signals at junction. Existing road alignment along ORR Gradient falling towards Kandirenahalli Junction. Ring Road having Straight alignment with Smooth Curve towards Kadirenahalli side.

Exiting Storm water drain running across the ORR from 180m way from Sarakki Junction.

This is one of the busiest junction as is leads to Bannerghatta Road and Mysore Road and Kanakapura Road.

The general topography in the stretch is having curves with varying horizontal alignment. There are developments in terms commercial establishments along this Stretch on both sides. Generally, Utilities are in footpath portion. Bus stops are found at both side of stretch.

The land use within the project area commercial establishments and public buildings.

4.3 Reconnaissance Survey

The consultants visited the site to acquaint themselves with the site and to study the various site related constraints which should be kept in mind while preparing the various alternatives solutions for reducing the delay at the junction.

- Presently traffic at Sarakki Junction and 35th Main Road Junctions are controlled by Automatic Signal
- Outer Ring Road bidirectional – 4 lane road.
- Kanakapura Main road is bidirectional – 4 lane road , having Metro at median.
- Metro Station adjacent to Sarakki Junction along Kanakapura Main road.
- Commercial establishments are present on either side of the ORR and Kanakapura Main Road.
- The parking banned on ORR and Kanakapura Main Road.

- Heavy traffic scenario both ORR and Kanakapura Road.
- It is to be noted that, presently the time required for a road user to go from Kadirenahalli Junction to Puttenahalli Junction along ORR is 20 to 25 minutes

4.4 Topographic Survey

Topographical surveys were conducted to capture the site features with total station and levelling data was collected using auto level. The GTS bench mark was transferred to the site by carrying out fly levelling and the bench marks were established at site. Entire levelling was carried out using GTS bench mark.

The following features were collected during survey:

- Existing road pavement surface, its variation in width along with all other relevant road details like centreline of carriageway, pavement edge, embankment/cutting edges top and bottom, side drains, signs, km posts etc.
- Location of traffic islands, median, police chowks, within limits of ROW.
- All religious places – churches, Towers, Parks, and Heritage Buildings etc., including location, building lines and clear dimension's of compound walls and extensions.
- Trees (position, species and girth measured 1.2m from ground level) Tree Species and type of crops.
- Building fronts and outlines (to be classified by construction type i.e. RCC/tiled house/thatched house etc with number of storey).

- Electric transformers, mast, tower, etc.
- All telephone lines. OFC lines, Private OFC lines, Water Pipes including manholes above the ground belonging to layouts/ colonies/nagars and other bodies, electricity lines etc.

Levels along the alignment were taken at every 10m intervals and at all intermediate breaks along the centre line of the existing alignment. Spot levels were recorded at critical points such as horizontal curve start, centre and end points and vertical curve start, centre and end points.

Cross sections, covering drain to drain on either side of service road or compound to compound or building line which ever was more, were taken at intervals of 10 m in general with levels at 5 m c/c. Cross sections were taken at the centre line of all culverts and at all critical points, mentioned earlier.

Details of the topographical survey are shown in drawing NC/BBMP/SARARKKI/TOPO-01 which is enclosed along with drawings volume.

4.5 Traffic Survey

Classified traffic volume count was carried out at the junction during December 2019 Vehicles recorded were classified based on its category for each turning movement at the junction timed at an interval of 15 minutes. The traffic survey was carried out for 15 hours covering the morning and evening peak hours. The following categories of vehicles were recorded during the survey:

Motorized vehicles:

- Two Wheeler,
- Three wheeler/ Auto Rickshaw,
- Cars(both old and new technology) / Jeeps,
- Van/ Tempo/ Minibus,
- Light Commercial Vehicles,
- Buses,
- Agricultural Tractor,
- Trucks: 2-Axle,
- Trucks: Multi-Axle.
- Agricultural Tractor - Trailer.

Non Motorized Vehicles

- Hand Drawn,
- Animal Drawn
- Pedal Cycle.

Table 4.5.1: Traffic Survey Locations

- **AT SARAKKI JUNCTION**

Type of Survey	Duration of Survey
Classified Turning Traffic Volume Count Survey	1 Days 15 Hours
Pedestrian Movement Survey	1 Day Morning Peak Hour and Evening Peak Hour
Queuing of Vehicles Survey	1 Day 12 Hours

- **AT ILAYS NAGAR JUNCTION.**

Type of Survey	Duration of Survey
Classified Turning Traffic Volume Count Survey	1 Day Morning Peak Hour and Evening Peak Hour

- **AT 35TH MAIN JUNCTION**

Type of Survey	Duration of Survey
Classified Turning Traffic Volume Count Survey	1 Day Morning Peak Hour and Evening Peak Hour

3.5.1 PCU Values Adopted

The present study area falls under urban limits, the PCU factors as per the recommendations of IRC-106: 1990 were adopted in converting no. of vehicles to PCU. The PCU values for each type of vehicles are presented in **Table 1.2.**

Table 1.2: PCU Values

Vehicles	PCU – for Composition of Vehicles with 5%	PCU - for Composition of Vehicles with 10% and Above
Two Wheeler	0.5	0.75
Auto Rickshaw	1.2	2
Car/Jeep/Van	1	1
Bus	2.2	3.7
LCV/ Mini-Bus	2.2	3.7
2 Axle Trucks	2.2	3.7
3 Axle Trucks	4	5
Multi Axle Trucks	4	5
Tractor	4	5
Tractor with Trailer	4	5
Cycles	0.4	0.5
Cycle Rickshaw	1.5	2
Animal Drawn Vehicles	1.5	2

3.5.2 Classified Turning Traffic Volume Count Survey

Classified turning traffic volume counts were conducted at the above mentioned location for a period of One day for duration of 15 hours continuously. The survey was conducted on 03.12.2019 from 07.00am to 10.00pm for the above said junction. This exhaustive survey was done manually by trained enumerators using hand tally. The data has been collected at every 15 Min interval of time. For effective vehicle counts, vehicle classification used in this traffic volume study was grouped under motorized and non-motorized categories. The motorized category was further classified as fast moving and slow moving vehicles. The vehicles passing through the survey station in all the allowed directions were enumerated and classified in accordance with the vehicle classification.

3.5.3 Pedestrian Movement Survey

A pedestrian movement survey both along as well as across the ORR and Kanakapura road has been conducted on 03.12.2019 during the morning peak hour and evening peak hour to assess the volume of pedestrian moving along the road and across the road and which will get conflicted with vehicular traffic.

3.5.4 Vehicle Queuing Survey

In order to assess the extent of delay occurring along the various arms of intersections and getting delayed during crossing of the intersection has been carried out and maximum queue length in each hour of the day and number of vehicles delayed in each cycle of signal or by means of manual operation of traffic signal due to heavy traffic movement at the intersection. The survey has been carried out on all four arms of the intersection from morning 08.00am to 08.00pm.

3.5.5 Data Analysis

3.5.5.1 Classified Traffic Volume Characteristics at Sarakki Junction.

3.5.5.2 Daily Traffic at Sarakki Junction

Classified traffic volume count survey has been carried out for duration of 15 hours for a day. Data has been presented below. Present traffic for duration of 15 hours at the location is **172902 PCU'sper day**. This traffic includes **172754 PCU's and 148 PCU's** as fast and slow moving vehicles respectively. It is understood from the above figures that, the intensity of non-motorised vehicles is very less which is around 1%. Summary of the present day traffic at the location is presented in **Table 1.3**.

3.5.5.3 Peak Hour Traffic at Sarakki Junction.

Peak Hour Traffic Volume for the location is **13703 PCU's per Hour.** This traffic includes **13690 PCU's and 13 PCU's** as fast and slow moving vehicles respectively. It is understood from the above figures that, the intensity of non-motorised vehicles is very less around 1.0%. The summary of the present average peak hour traffic at the location is presented in **Table 1.4**.

3.5.5.4 Hourly Variation of Traffic at Sarakki Junction

Day 15 Hour Traffic is analysed for the hourly distribution of traffic. Based on the observation on the day traffic data, the traffic volume at the junction has indicated that during 6.00pm to 7.00pm has higher volume of traffic. But it is also observed that, the remaining hours of the survey duration except after 8.00pm upto 10.00pm, all other hours i.e. for remaining 14 hours, the volume of traffic is 60% to 99% of the peak hour traffic volume. It means, the traffic volume is almost uniform throughout the day. The detail of traffic intensity during the day and the hourly variation in terms of vehicles is represented graphically in **Figure 1.1**.

Table 1.3: Present Traffic at Sarakki Junction (15 Hour)

	Vehicles	D-1 to D-2	D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	D-2 to D-1	Total Traffic from D-2	D-3 to D-2	D-3 to D-4	Total Traffic from D-3	D-4 to D-1	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	**Two Wheeler**	2675	1197	13484	**17356**	12266	4613	690	**17569**	12942	3082	**16024**	12743	3402	2553	**18698**	**69647**	45.37%
	Auto Rickshaw	925	929	3351	**5205**	3703	1210	514	**5427**	4273	665	**4938**	4347	2218	829	**7394**	**22964**	14.96%
	Car/Jeep/ Van/Taxi	573	609	2526	**3708**	4452	1766	420	**6638**	5880	1761	**7641**	3545	1828	1737	**7110**	**25097**	16.35%
	Taxi	336	517	2376	**3229**	4563	1198	163	**5924**	5256	656	**5912**	2983	1315	801	**5099**	**20164**	13.13%
	Govt Bus	1	44	1484	**1529**	40	2	2	**44**	32	6	**38**	2026	13	9	**2048**	**3659**	2.38%
	Pvt Bus	20	33	341	**394**	271	6	14	**291**	62	32	**94**	51	87	40	**178**	**957**	0.62%
	Institute Bus	21	30	69	**120**	67	34	35	**136**	55	125	**180**	12	59	51	**122**	**558**	0.36%
	Mini Bus	44	54	493	**591**	382	58	48	**488**	337	79	**416**	90	120	71	**281**	**1776**	1.16%
	Mini LCV	140	31	1028	**1199**	841	413	56	**1310**	1362	93	**1455**	113	197	309	**619**	**4583**	2.99%
	LCV-4 Tyre	10	43	587	**640**	386	104	9	**499**	122	249	**371**	48	246	32	**326**	**1836**	1.20%
	2-Axle Truck	12	2	157	**171**	73	4	8	**85**	22	88	**110**	31	157	51	**239**	**605**	0.39%
	3-Axle Truck	3	0	0	**3**	19	71	9	**99**	0	0	**0**	71	152	27	**250**	**352**	0.23%
	Multi-Axle Truck	0	4	28	**32**	6	136	9	**151**	2	4	**6**	475	212	2	**689**	**878**	0.57%
	Agri.Tractor With Trailer	11	3	59	**73**	7	2	4	**13**	7	13	**20**	28	40	10	**78**	**184**	0.12%

	Agri.Tractor Without Trailer	0	0	6	**6**	4	1	2	**7**	0	3	**3**	4	10	0	**14**	**30**	0.02%
SLOW MOVING VEHICLES	**Cycle**	4	26	28	**58**	19	7	7	**33**	23	23	**46**	2	39	7	**48**	**185**	0.12%
	Animal Drawn Bullock Cart	0	0	0	**0**	7	0	0	**7**	0	0	**0**	0	3	0	**3**	**10**	0.01%
	Animal Drawn Horse Cart	0	0	0	**0**	7	4	0	**11**	2	0	**2**	5	2	4	**11**	**24**	0.02%
	Hand Drawn	0	0	0	**0**	0	0	0	**0**	0	0	**0**	0	0	0	**0**	**0**	0.00%
	AMBULANCE	0	2	2	**4**	5	0	0	**5**	1	0	**1**	2	1	3	**6**	**16**	0.01%
	Total Fast Moving Vehicles	**4771**	**3496**	**25989**	**34256**	**27080**	**9618**	**1983**	**38681**	**30352**	**6856**	**37208**	**26567**	**10056**	**6522**	**43145**	**153290**	**99.85%**
	Total Slow Moving Vehicles	**4**	**28**	30	**62**	**38**	**11**	7	**56**	**26**	**23**	**49**	**9**	**45**	**14**	**68**	**235**	**0.15%**
	Total Vehicles	**4775**	**3524**	26019	**34318**	**27118**	**9629**	1990	**38737**	**30378**	**6879**	**37257**	**26576**	**10101**	**6536**	**43213**	**153525**	**100.00%**
	Total Fast Moving PCU	**5207**	**4329**	**29553**	**39089**	**28976**	**10463**	**2497**	**41936**	**32351**	**7281**	**39632**	**31979**	**12997**	**7128**	**52104**	**172754**	
	Total Slow Moving PCU	**2**	**14**	**14**	**29**	**36**	**9**	**3**	**48**	**14**	**10**	**23**	**12**	**25**	**13**	**49**	**148**	
	Total PCU	**5209**	**4343**	**29567**	**39118**	**29012**	**10472**	**2500**	**41984**	**32365**	**7291**	**39655**	**31991**	**13022**	**7141**	**52153**	**172902**	
	Directional Distribution	**3.01%**	**2.51%**	**17.10%**	**22.62%**	**16.78%**	**6.06%**	**1.45%**	**24.28%**	**18.72%**	**4.22%**	**22.93%**	**18.50%**	**7.53%**	**4.13%**	**30.16%**	**100%**	

D-1 : Banashankari D-2 : JP Nagar D-3 : Kanakapura D-4 : Kadirenahalli

Table 1.4: Present Peak Hour Traffic at Sarakki Junction

	Vehicles	D-1 to D-2	D-1 to D-3	D-1 to D-4	Total Traffic from D-1	D-2 to D-3	D-2 to D-4	D-2 to D-1	Total Traffic from D-2	D-3 to D-2	D-3 to D-4	Total Traffic from D-3	D-4 to D-1	D-4 to D-2	D-4 to D-3	Total Traffic from D-4	Total from All Directions	Composition of Vehicles
FAST MOVING VEHICLES	Two Wheeler	393	90	1161	**1644**	919	388	60	**1367**	984	175	**1159**	1280	181	158	**1619**	**5789**	47.08%
	Auto Rickshaw	78	30	157	**265**	357	94	59	**510**	185	23	**208**	417	146	47	**610**	**1593**	12.96%
	Car/Jeep/ Van/Taxi	60	20	201	**281**	435	115	45	**595**	410	126	**536**	331	111	116	**558**	**1970**	16.02%
	Taxi	27	25	184	**236**	421	83	17	**521**	325	20	**345**	296	82	78	**456**	**1558**	12.67%
	Govt Bus	0	1	113	**114**	6	0	0	**6**	3	2	**5**	207	6	7	**220**	**345**	2.81%
	Pvt Bus	0	0	18	**18**	21	2	2	**25**	9	4	**13**	2	10	7	**19**	**75**	0.61%
	Institute Bus	0	0	0	**0**	8	6	0	**14**	2	10	**12**	0	17	2	**19**	**45**	0.37%
	Mini Bus	3	0	41	**44**	37	7	5	**49**	76	1	**77**	9	9	11	**29**	**199**	1.62%
	Mini LCV	11	0	89	**100**	72	30	7	**109**	115	2	**117**	0	21	20	**41**	**367**	2.98%
	LCV-4 Tyre	2	0	55	**57**	44	6	0	**50**	28	14	**42**	0	0	3	**3**	**152**	1.24%
	2-Axle Truck	1	0	14	**15**	4	0	2	**6**	0	5	**5**	0	25	1	**26**	**52**	0.42%
	3-Axle Truck	0	0	0	**0**	0	3	0	**3**	0	0	**0**	2	22	0	**24**	**27**	0.22%
	Multi-Axle Truck	0	0	0	**0**	0	9	0	**9**	0	0	**0**	54	26	0	**80**	**89**	0.72%
	Agri.Tractor With Trailer	1	0	1	**2**	3	0	0	**3**	0	1	**1**	3	7	2	**12**	**18**	0.15%
	Agri.Tractor Without Trailer	0	0	0	**0**	0	0	0	**0**	0	0	**0**	0	1	0	**1**	**1**	0.01%

SLOW MOVING VEHICLES	Cycle	0	0	0	0	3	1	0	4	1	1	2	0	3	1	4	10	0.08%
	Animal Drawn Bullock Cart	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Animal Drawn Horse Cart	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0.01%
	Hand Drawn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	AMBULANCE	0	0	1	1	1	0	0	1	0	0	0	1	1	1	3	5	0.04%
	Total Fast Moving Vehicles	576	166	2034	2776	2327	743	197	3267	2137	383	2520	2601	664	452	3717	12280	99.87%
	Total Slow Moving Vehicles	0	0	1	1	4	2	0	6	1	1	2	1	4	2	7	16	0.13%
	Total Vehicles	576	166	2035	2777	2331	745	197	3273	2138	384	2522	2602	668	454	3724	12296	100.00%
	Total Fast Moving PCU	567	175	2152	2894	2572	798	251	3621	2181	398	2579	3126	975	500	4601	13690	
	Total Slow Moving PCU	0	0	2	2	3	2	0	5	1	1	1	2	3	2	6	13	
	Total PCU	567	175	2154	2896	2575	800	251	3626	2182	399	2580	3128	978	502	4607	13703	
	Directional Distribution	4.14%	1.28%	15.72%	21.13%	18.79%	5.84%	1.83%	26.46%	15.92%	2.91%	18.83%	22.83%	7.14%	3.66%	33.62%	100%	

D-1 : Banashankari D-2 : JP Nagar D-3 : Kanakapura D-4 : Kadirenahalli

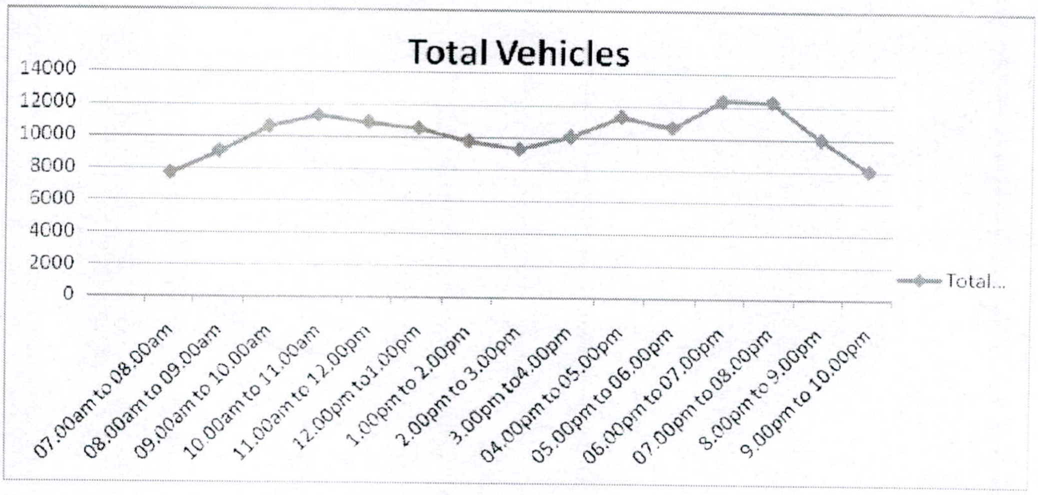


Figure 1.1: Hourly Mode-Wise Variation of Traffic at Sarakki Junction.

3.5.5.5 Traffic Composition at Sarakki Junction

The percentage share of different category of vehicles in the total traffic stream in terms of number of vehicles at the survey location has been analysed. From the data it is observed that maximum percentage of Four Wheelers and Two-Wheeler traffic observed and followed by Autos, Buses and remaining vehicles. The day average traffic composition observed at the location is plotted graphically and presented in **Figure 1.2 and Figure 1.3** for 15 hours and peak hour.

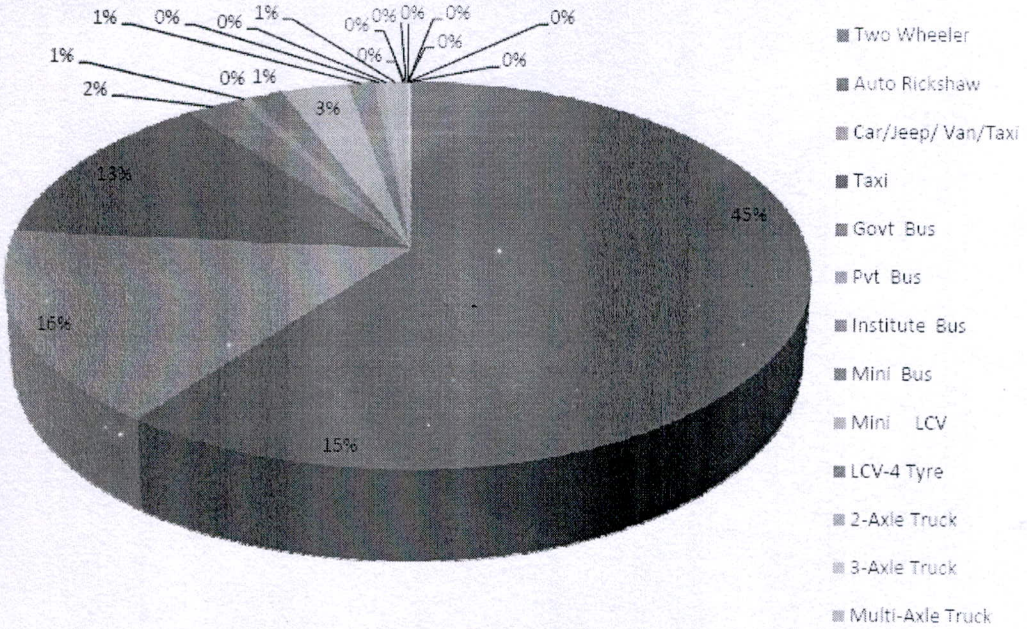


Figure 1.2: 14 Hour Average Composition of Vehicles at Sarakki Junction

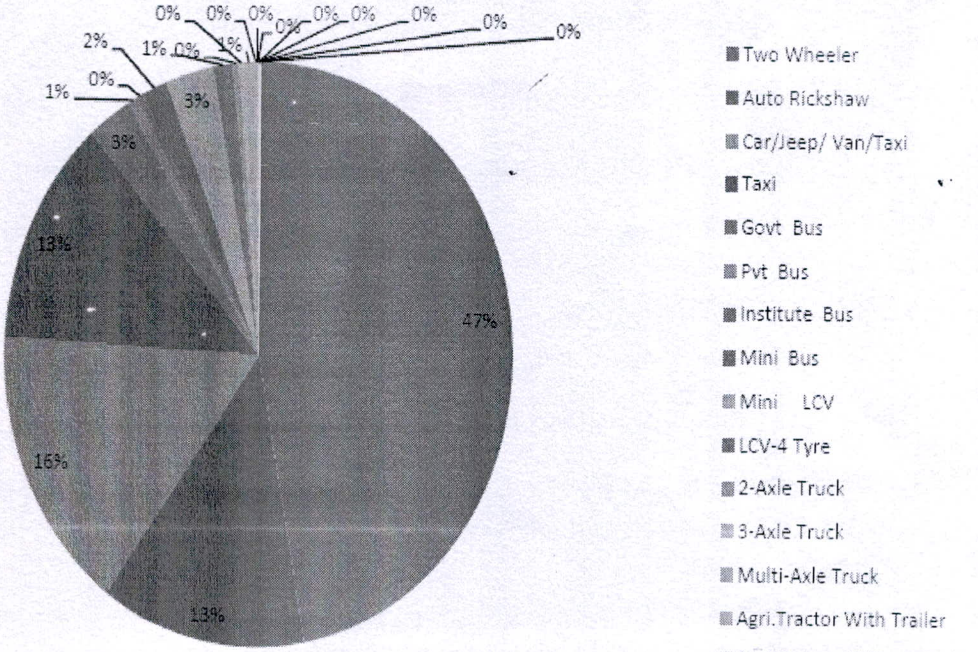


Figure 1.3: Peak Hour Composition of Vehicles at Sarakki Junction

3.5.5.6 Day Traffic Summary at Sarakki Junction

Details of the day traffic details in terms of 15hour traffic, peak hour traffic and the directional traffic for each day is presented in tables below.

Table 1.5: Summary of Day Traffic at Sarakki Junction

Day & Duration	15 Hour Data		Peak Hour Data		
	Total Vehicles	Total PCU	Peak Hour	Total Vehicles	Total PCU
Day-1	153525	172902	06.00am to 07.00am	12296	13703

Figure 1.4: Day Average 15 Hour Traffic at Sarakki Junction

Direction and Day	Day-1		
	Total Vehicles	Total PCU	% of Distribution
D-1 to D-2	4775	5209	3.01%
D-1 to D-3	3524	4343	2.51%
D-1 to D-4	26019	29567	17.10%
Total Traffic from D-1	**34318**	**39119**	**22.62%**
D-2 to D-1	1990	2500	1.45%
D-2 to D-3	27118	29012	16.78%
D-2 to D-4	9629	10472	6.06%
Total Traffic from D-2	**38737**	**41984**	**24.28%**
D-3 to D-2	30378	32365	18.72%
D-3 to D-4	6879	7291	4.22%
Total Traffic from D-3	**37257**	**39656**	**22.94%**
D-4 to D-1	26576	31991	**18.50%**
D-4 to D-2	10101	13022	**7.53%**
D-4 to D-3	6536	7141	**4.13%**
Total Traffic from D-4	**43213**	**52154**	**30.16%**
Total from All Directions	**153525**	**172913**	**100%**

D-1 : Banashankari D-2 : Kadirenahalli D-3 : JP Nagar D-4 : Kanakapura

Figure 1.5: Peak Traffic at Sarakki Junction

Direction and Day	**Day-1**		
	Total Vehicles	**Total PCU**	**% of Distribution**
D-1 to D-2	576	567	4.14%
D-1 to D-3	166	175	1.28%
D-1 to D-4	2035	2154	15.72%
Total Traffic from D-1	**2777**	**2896**	**21.13%**
D-2 to D-1	197	251	1.83%
D-2 to D-3	2331	2575	18.79%
D-2 to D-4	745	800	5.84%
Total Traffic from D-2	**3273**	**3626**	**26.46%**
D-3 to D-2	2138	2182	15.92%
D-3 to D-4	384	399	2.91%
Total Traffic from D-3	**2522**	**2581**	**18.84%**
D-4 to D-1	2602	3128	22.83%
D-4 to D-2	668	978	7.14%
D-4 to D-3	454	502	**3.66%**
Total Traffic from D-4	**3724**	**4608**	**33.63%**
Total from All Directions	**12296**	**13711**	**100%**

D-1 : Banashankari D-2 : Kadirenahalli D-3 : JP Nagar D-4 : Kanakapura

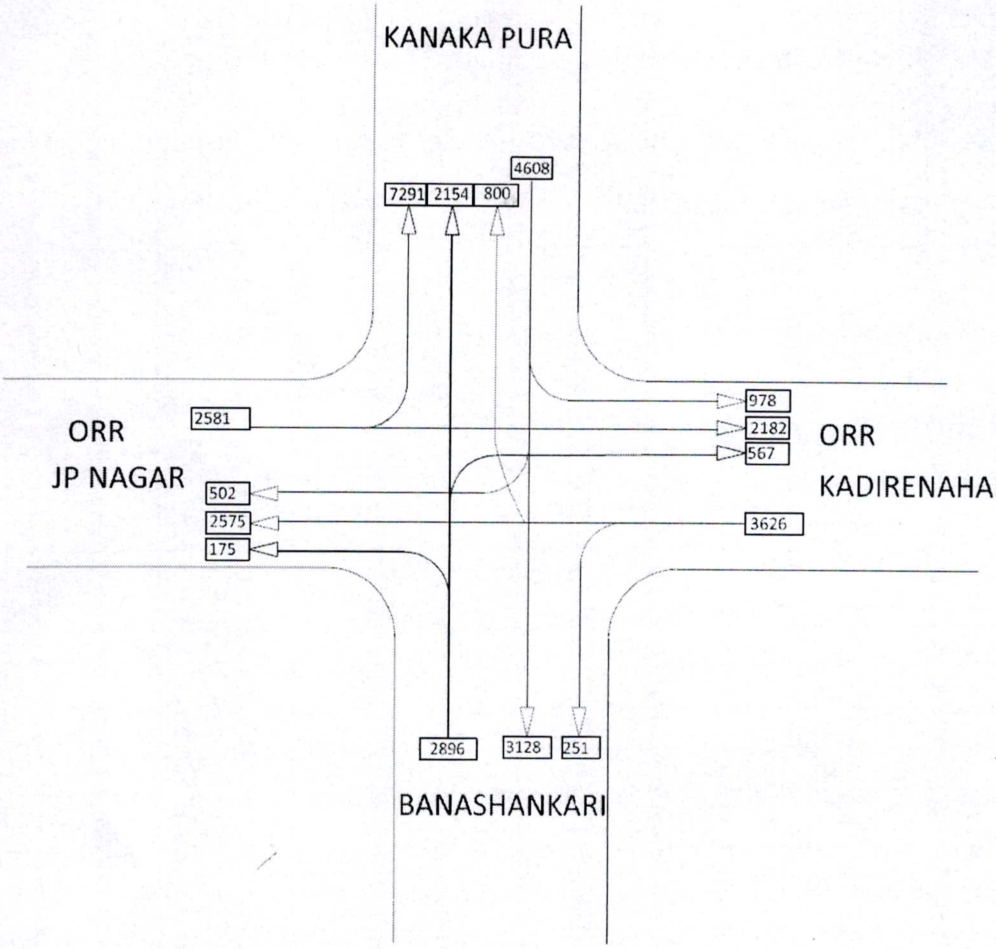


Figure 1.5: Day Peak Hour Traffic at Sarakki Junction

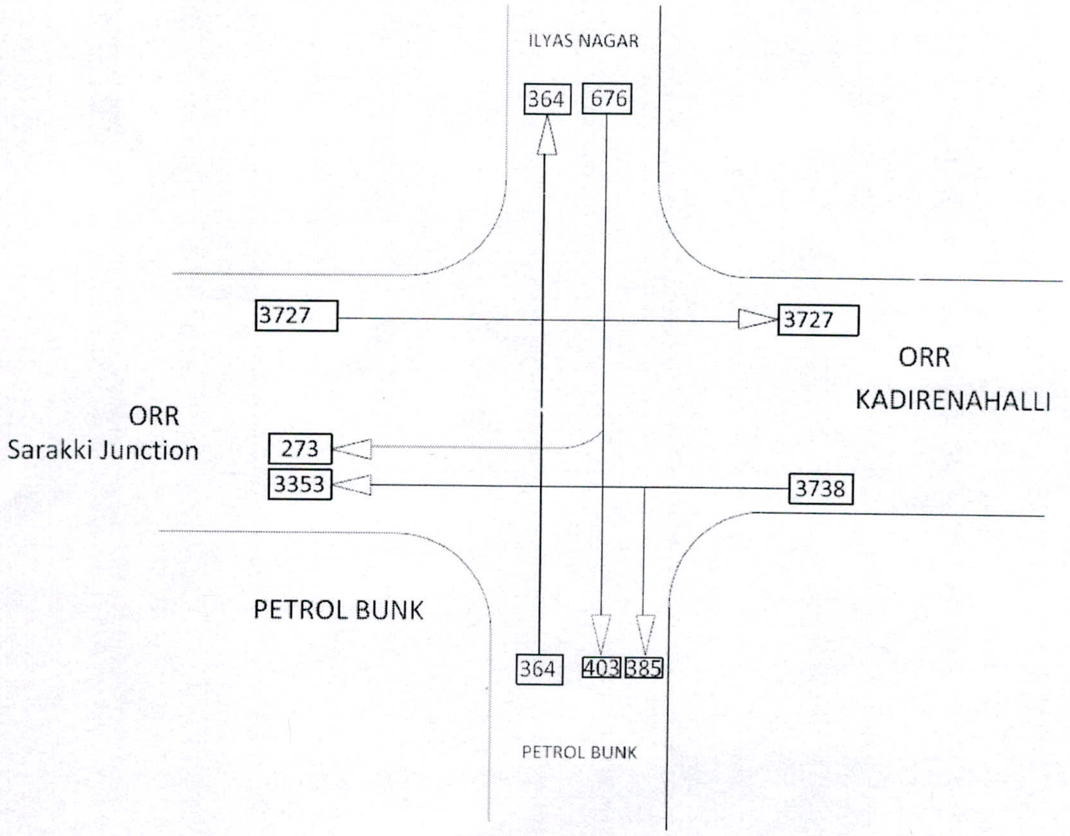
3.5.5.7 Day Traffic Summary at ILYASNAGAR JUNCTION

Details of the peak hour turning traffic and the directional traffic is presented in tables below.

	Vehicles	D-1 to D-2	D-2 to D-3	D-3 to D-4	D-4 to D-2	Total Traffic	Composition of Vehicles
FAST MOVING VEHICLES	**Two Wheeler**	381	341	257	375	**1354**	86.86%
	Auto Rickshaw	28	31	27	37	**123**	7.90%
	Car/Jeep/ Van/Taxi	8	16	11	16	**51**	3.29%
	Taxi	9	13	13	14	**49**	3.12%
	Govt Bus	0	0	0	0	**0**	0.00%
	Pvt Bus	7	0	1	0	**8**	0.51%
	Institute Bus	0	4	0	4	**8**	0.51%
	Mini Bus	0	0	0	0	**0**	0.00%
	Mini LCV	0	0	0	0	**0**	0.00%
	LCV-4 Tyre	0	0	0	0	**0**	0.00%
	2-Axle Truck	0	0	0	0	**0**	0.00%
	3-Axle Truck	0	0	0	0	**0**	0.00%
	Multi-Axle Truck	0	0	0	0	**0**	0.00%
	Agri.Tractor With Trailer	2	2	0	2	**6**	0.38%
	Agri.Tractor Without Trailer	0	0	0	0	**0**	0.00%
SLOW MOVING VEHICLES	**Cycle**	0	0	0	0	**0**	0.00%
	Animal Drawn Bullock Cart	0	0	0	0	**0**	0.00%
	Animal Drawn Horse Cart	1	0	0	0	**1**	0.06%
	Hand Drawn	0	0	0	0	**0**	0.00%
	AMBULANCE	0	0	0	0	**0**	0.00%

	Total Fast Moving Vehicles	**435**	**407**	**309**	**407**	**1558**	**102.58%**
	Total Slow Moving Vehicles	**1**	**0**	0	0	**1**	**0.06%**
	Total Vehicles	**436**	**407**	**309**	**407**	**1559**	**102.65%**
	Total Fast Moving PCU	**383**	**364**	**273**	**403**	**1423**	
	Total Slow Moving PCU	**2**	**0**	**0**	**0**	**2**	
	Total PCU	**385**	**364**	**273**	**403**	**1425**	
	Directional Distribution	**27.02%**	**25.54%**	**19.16%**	**28.28%**	**100.00%**	

Figure 1.5: Day Peak Hour Traffic at Ilyannagar Junction

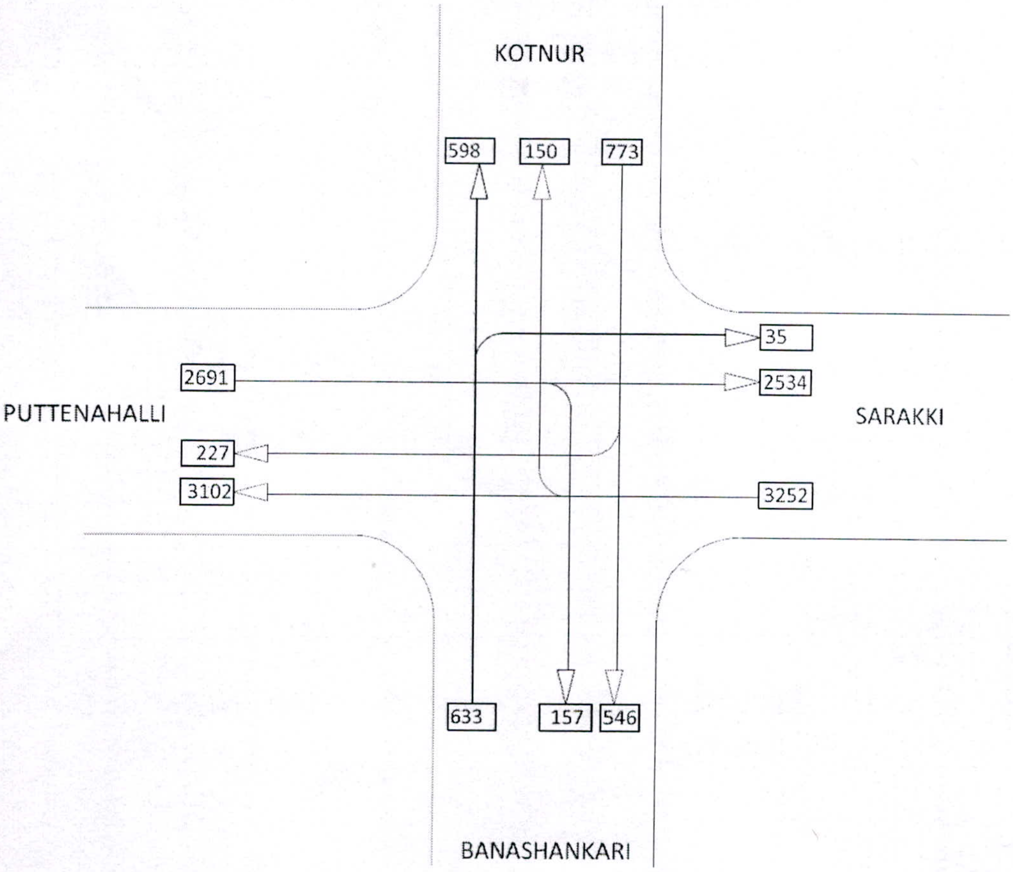


3.5.5.8 Day Traffic Summary at 35TH MAIN JUNCTION

Details of the peak hour turning traffic and the directional traffic is presented in tables below.

	Vehicles	D-1 to D-4	D-2 to D-3	D-3 to D-4	D-3 to D-1	D-4 to D-2	D-4 to D-3	Total Traffic from D-1	Composition of Vehicles
FAST MOVING VEHICLES	Two Wheeler	89	102	693	195	19	764	**1862**	183.99%
	Auto Rickshaw	28	14	8	18	7	6	**81**	8.00%
	Car/Jeep/ Van/Taxi	16	17	3	10	2	7	**55**	5.43%
	Taxi	5	20	2	0	4	6	**37**	3.66%
	Govt Bus	0	0	0	10	0	0	**10**	0.99%
	Pvt Bus	0	0	2	0	0	0	**2**	0.20%
	Institute Bus	0	0	0	0	0	0	**0**	0.00%
	Mini Bus	4	0	0	0	0	0	**4**	0.40%
	Mini LCV	3	3	0	0	0	0	**6**	0.59%
	LCV-4 Tyre	0	0	0	0	0	0	**0**	0.00%
	2-Axle Truck	1	0	0	0	0	0	**1**	0.10%
	3-Axle Truck	0	0	0	0	0	0	**0**	0.00%
	Multi-Axle Truck	0	0	0	3	0	0	**3**	0.30%
	Agri.Tractor With Trailer	0	1	0	0	0	0	**1**	0.10%
	Agri.Tractor Without Trailer	0	0	0	0	0	0	**0**	0.00%
SLOW MOVING VEHICLES	Cycle	1	0	0	0	0	0	**1**	0.10%
	Animal Drawn Bullock Cart	0	0	0	0	0	0	**0**	0.00%
	Animal Drawn Horse Cart	0	0	0	0	0	0	**0**	0.00%
	Hand Drawn	0	0	0	0	0	0	**0**	0.00%
	AMBULANCE	0	0	0	0	0	0	**0**	0.00%
	Total Fast Moving Vehicles	**146**	**157**	**708**	**236**	**32**	**783**	**1011**	**203.75%**

	Total Slow Moving Vehicles	1	0	0	0	0	0	1	**0.10%**
	Total Vehicles	**147**	**157**	**708**	**236**	**32**	**783**	**1012**	**203.85%**
	Total Fast Moving PCU	**156**	**150**	**546**	**227**	**35**	**598**	**1712**	
	Total Slow Moving PCU	**1**	**0**	**0**	**0**	**0**	**0**	**1**	
	Total PCU	**157**	**150**	**546**	**227**	**35**	**598**	**1713**	
	Directional Distribution	9.17%	8.76%	31.87%	13.25%	2.04%	34.91%	**100.00%**	



1.0Figure 1.5: Day Peak Hour Turning Traffic at 35th Main Junction

3.5.5.9 Details of Pedestrian Movement at Sarakki Junction

In order to ascertain the effect of conflict of pedestrian movement along the road and across the road on ORR as well as on Road to Kanakapura Road, a sample survey has been carried out on both arms of road to know about the requirement of safe pedestrian facilities. The following **Table 1.13 and Table 1.14** give summary of the pedestrian along the road and across the road at Sarakki Junction.

Table 1.13: Present Peak Hour Pedestrian Movement along Outer Ring Road at Sarakki Junction

Direction	ACROSS THE ORR			ALONG THE ORR		
Time	Crossing From LHS	Crossing From RHS	Total	Along the ORR From ilyas Nagar to JP nagar	Along the ORR From JP Nagar to ilyas Nagar	Total
08.00am to 09.00am	477	244	721	197	189	386
09.00am to 10.00am	511	262	773	211	203	414
05.00pm to 06.00pm	532	272	804	219	211	430
06.00pm to 07.00pm	442	226	668	182	175	357

Table 1.15: Present Peak Hour Pedestrian – Vehicular Traffic Conflict

Details/Day	Along ORR
Peak Hour Pedestrian Volume Crossing Road	804
Vehicular Traffic Volume on Road	13711
PV^2	

3.5.5.10 Details of Vehicles in Queue on all Approaches of Sarakki Junction

Along with detailed traffic turning volume count survey at the junction, Vehicles Queuing on all the approaches of junction arms also has been carried out to indicate the delay and congestion occurring at the junction for crossing the junction location. **Table 1.16** gives the maximum length of queue and number of vehicles in queue observed in each hour of the day.

Table 1.16: Details of Vehicle Queue Length and Number of Vehicles in Queue

Time/Direction	From Kadirenahalli	From JP Nagar	From Kanakapura	From Banashankari
	Length of Queue, m	Length of Queue, m	Length of Queue, m	Length of Queue, m
08.00am to 09.00am	140	110	250	230
09.00am to 10.00am	140	125	220	210
10.00am to 11.00am	140	140	230	210
11.00am to 12.00am	130	120	220	210
12.00am to 01.00pm	115	110	190	200
01.00pm to 02.00pm	110	105	190	200
02.00pm to 03.00pm	110	80	180	190
03.00pm to 04.00pm	115	90	180	190
04.00pm to 05.00pm	100	100	180	180
05.00pm to 06.00pm	170	150	190	190
06.00pm to 07.00pm	140	150	230	250
07.00pm to 08.00pm	120	130	220	230

From the above that, it is observed that, the vehicles at the junction are waiting for the long duration and length. Based on the site observation, the traffic control signal was operated manually for about 9 hours out of 12 hours survey time. Hence it is evident that, the volume at the intersection is too high and cannot be able to clear within a short time.

3.5.5.11 Justification of Grade Separated Facilities across Junction

As per IRC: SP: 41-1994, IRC: 92-1985 and IRC: 62-1976, the necessity for providing grade separation and interchange facility for any intersection, will arise at the following situations:

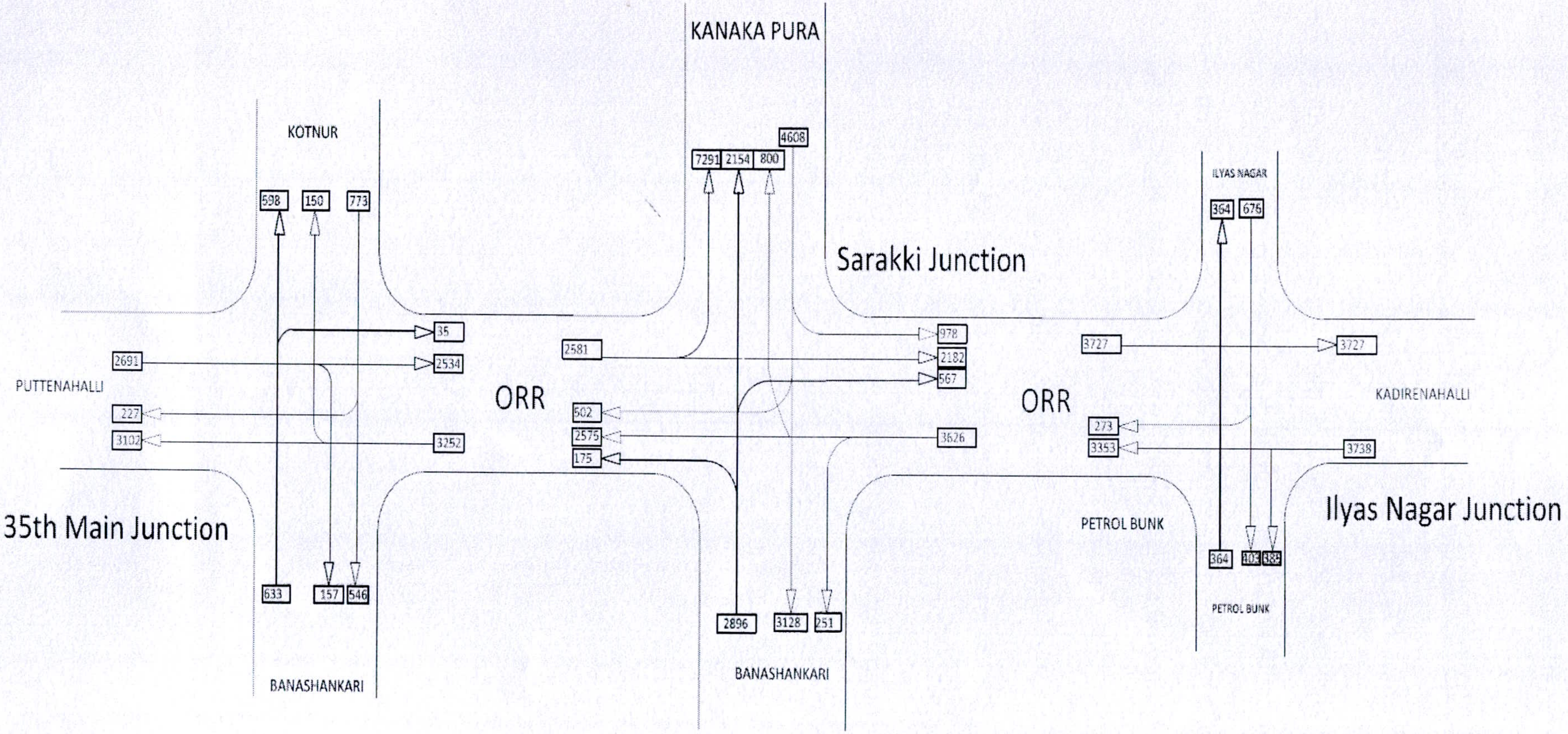
- When the total traffic on all the arms of the existing intersection is in excess of 10,000 PCU's per hour, resulting in serious congestion and frequent choking of the intersection.
- When the signal stopping time at the existing intersection exceeds 120 sec.
- When the estimated traffic volume within next 5 years is in excess of the capacity of the existing intersection.
- When the proposed highway is to be designed as a complete access controlled highway.
- When the project road is to be designed as expressway.

The present average peak hour traffic at Sarakki junction is 12315 PCU per hour. It is general trend that, the traffic will continue to grow in future with increase in population with the time. Hence based on the above guidelines, the volume of traffic at both intersections has already crossed the 10000PCU per hour. Hence, it is proposed to provide a grade separator at Sarakki Junction along the Outer Ring Road to facilitate free flow of through traffic without any interruption.

3.5.5.12 Combined Traffic Flow considering Both Junctions

To understand the overall traffic movement condition at both junctions, the traffic flow in each direction has been presented for the present day condition. **Figure 1.11** below indicates the directional split in each allowed traffic movement has been indicated.

Based on the detailed traffic survey and analysis, it is understood that, the traffic flow at the intersection from all directions has already exceed 10000 PCU per hour. In view of this condition and looking at the through traffic along the ORR road, which is in the range of 35% of the total traffic at the intersection, a flyover has been proposed along the ORR road. **Figure 1.12** shows the traffic movement at the ground level after proposed flyover along the ORR.


KOTNUR
PUTTENAHALLI
ORR
35th Main Junction
BANASHANKARI
KANAKA PURA
Sarakki Junction
BANASHANKARI
ILYAS NAGAR
ORR
KADIRENAHALLI
PETROL BUNK
Ilyas Nagar Junction
PETROL BUNK

3.5.5.13 Traffic Projections

For improving the existing traffic operation, it is necessary to propose certain improvements in terms of facility. Whenever such facilities are proposed, the facilities should not be designed for current, but shall cater for future requirement also. The future requirement will be normally estimated based on the present condition and the factors influencing the future growth. Hence, here also, an effort has been made to estimate the future traffic along the road section.

For the purpose of estimating the future traffic, 7.5% of traffic growth has been considered. Details of the Peak Hour projected traffic for next 25 years are presented in **Table 1.17** below.

Table 1.17: Peak Hour Traffic Forecast Details for sarakki Junction

Year	Two Wheeler	Auto Rickshaw	Car/Jeep/ Van/T	Taxi	Govt Bus	Pvt Bus	Institute Bus	Mini Bus	Mini LCV	LCV-4 Tyre	2-Axle Truck	3-Axle Truck	Multi-Axle	actor With	actor Without	Total Vehicles	Total PCU
2019	5789	1593	1970	1558	345	75	45	199	367	171	52	27	89	18	1	12315	88725
2020	6137	1689	2089	1652	366	80	48	211	390	182	56	29	95	20	2	13054	94049
2021	6506	1791	2215	1752	388	85	51	224	414	193	60	31	101	22	3	13838	99692
2022	6897	1899	2348	1858	412	91	55	238	439	205	64	33	108	24	4	14669	105674
2023	7311	2013	2489	1970	437	97	59	253	466	218	68	35	115	26	5	15550	112015
2024	7750	2134	2639	2089	464	103	63	269	494	232	73	38	122	28	6	16483	118736
2025	8215	2263	2798	2215	492	110	67	286	524	246	78	41	130	30	7	17472	125861
2026	8708	2399	2966	2348	522	117	72	304	556	261	83	44	138	32	8	18521	133413
2027	9231	2543	3144	2489	554	125	77	323	590	277	88	47	147	34	9	19633	141418
2028	9785	2696	3333	2639	588	133	82	343	626	294	94	50	156	37	10	20811	149904
2029	10373	2858	3533	2798	624	141	87	364	664	312	100	53	166	40	11	22060	158899
2030	10996	3030	3745	2966	662	150	93	386	704	331	106	57	176	43	12	23384	168433
2031	11656	3212	3970	3144	702	159	99	410	747	351	113	61	187	46	13	24788	178539
2032	12356	3405	4209	3333	745	169	105	435	792	373	120	65	199	49	14	26276	189252
2033	13098	3610	4462	3533	790	180	112	462	840	396	128	69	211	52	15	27853	200608
2034	13884	3827	4730	3745	838	191	119	490	891	420	136	74	224	56	16	29525	212645
2035	14718	4057	5014	3970	889	203	127	520	945	446	145	79	238	60	17	31297	225404
2036	15602	4301	5315	4209	943	216	135	552	1002	473	154	84	253	64	19	33175	238929
2037	16539	4560	5634	4462	1000	229	144	586	1063	502	164	90	269	68	21	35166	253265
2038	17532	4834	5973	4730	1060	243	153	622	1127	533	174	96	286	73	23	37276	268461
2039	18584	5125	6332	5014	1124	258	163	660	1195	565	185	102	304	78	25	39513	284569
2040	19700	5433	6712	5315	1192	274	173	700	1267	599	197	109	323	83	27	41884	301644
2041	20882	5759	7115	5634	1264	291	184	742	1344	635	209	116	343	88	29	44398	319743
2042	22135	6105	7542	5973	1340	309	196	787	1425	674	222	123	364	94	31	47062	338928
2043	23464	6472	7995	6332	1421	328	208	835	1511	715	236	131	386	100	33	49886	359264

3.5.5.14 Outcome of Traffic Data Analysis

- Present Traffic Survey of the Junctions reveals that, there is maximum percentage of Two Wheeler traffic, followed by Four Wheelers which are in the range of 45% and 17% respectively. The auto rickshaw/three wheelers are around 14%. Buses including Govt., Private and institutional buses together constitutes around 5% and goods vehicle of all types is 10% and composition of non-motorized vehicles is very less.

- Present Traffic Conflict Condition at Sarakki Junction

  As per the ground condition regarding the layout of the junction, it is a four arm intersection having ORR and Kanakapura Road as major.

  Generally for four leg intersection, there will be totally twelve conflict points when all the direction of travels is allowed. But presently, at this location one right turn has been banned to Bananshankari from JP nagar which is close to junction has also been banned.

  The road leading to Banashankari Bus Stand and JP nagar Metro Station where only the local and sub urban buses are entering for facilitating the commuter from surrounding areas. The buses coming from Kanakapura, Banashankari, Kadirenahalii and JP nagar shall travel along the ORR and Kanakapura Main road.

- As per IRC: 92-1985, if the total traffic at the junction from all the arms exceeds 10000PCU/hour, then such junctions shall be provided with Grade separated facilities to ease out the traffic congestion at the junction. At the junction, the present average traffic observed is 12315 PCU per hour which has already crossed the value of 10000PCU per hour as per IRC guidelines. From the above table, where the directional split of traffic in percentage is indicated, the traffic volume from each approach indicates that, D-1 i.e. (From Banashankari) is contributing 21.13%, D-2 i.e. (from Kadirenahalli) is 26.46 %, D-3 i.e. (from JP Nagar) is 18.84% and D-4 i.e. (from Kanakapura) is 33.63%.

When it critically looked in terms of each direction of traffic movement, the straight traffic along ORR contributes around 35% of total traffic at the intersection. In view of this major percentage of traffic getting conflicted with other directions and causing undue delay at intersection, it is proposed to provide a flyover of 2 lane in each direction and segregate the straight traffic along ORR with other direction traffic. Hence to avoid, further congestion and delay at the intersection, it is recommended to provide a grade separated facility at Sarakki Junction along ORR.

4.6 Soil Investigation

Bore hole investigations were carried out to determine the profile of soil strata under the ground at the project location. It was also an essential part of the requirements for design of the structure. The results of the soil investigations are enclosed as **Appendix -2.**

4.7 Roadside Investigations

Preparation of road inventory of the project road was undertaken first. The purpose of the survey was to obtain the necessary information regarding the road features along the project road, condition and performance of drainage structures and other ancillary road features like footpath, median, kerbs etc. An integrated program to carry out surveys and investigations were developed, using IRC SP -19 as a general guide.

The following information was collected as part of the survey

- Carriageway width
- Shoulder widths
- Surface type for carriageway and shoulders
- Embankment or cut and approximate height
- Location, type and condition of side drains
- Location and type of road access and roadside features (parking bays, bus stops, and all major and minor commercial establishments)
- Roadside land use (agriculture, barren, built-up. slum areas, urban)
- Presence of crossing traffic (vehicular, pedestrian)

CHAPTER- 5 – PLANNING AND DESIGN CRITERIA

5.1 Planning Grade Separator.

One or combination of the following usually guides planning of grade separator in urban areas:

- Elimination of conflicting traffic streams of traffic
- Hierarchy of the intersecting roads
- Intersection traffic characteristics
- Present development level and proposed development pattern for the influence area
- Lack of alternative routes / modes
- Feasibility with respect to available space and minimum land acquisition
- Utilities present at the project location, feasibility of shifting / relocation
- Other major infrastructure projects planned
- Cost and Economic considerations
- Traffic diversions and management during construction

5.2 Planning Criteria

The following paragraphs briefly highlight the various Design considerations and standards used for the present proposal. However, it is important that the preamble to Design criteria are clearly understood in the context of urban development –especially with due consideration to traffic, existing road network, development pattern, tight of way, rise and fall of road etc.

The Indian Roads Congress and the Ministry of Surface Transport and Highways specify various guidelines and specifications for flyovers, junctions and other facilities pertaining to flyovers. These specifications are largely based on the theoretical considerations and ideal situations which can hardly be obtained in urban situation for a city like the present one. Hence, in the present proposal, certain changes and modifications in the Design standards are reviewed keeping in view the site constraints.

5.3 Design loads

- **Vehicular Live loads**

The elevated corridor is proposed for the CORE- city area catering for local vehicles. Inview of the same elevated corridor is designed for IRC- Class A vehicle.

Impact factor considered as per IRC-6-2000, corresponding to class A- Vehicles.

- **Wind forces**
- Wind forces have been considered as per IRC: 6 – 2000 and subsequent amendments in the latest edition of Indian Highways, February 2008.

The appropriate wind force on 10m high lighting pole @ 30 m c/c has been considered in the design.

- **Seismic force**

The flyover has been designed for the seismic force as per the provisions of IRC-6-2000.

- **Temperature range**

i) For design of structure to account for temperature in formula,

(DL) = a Lt,

The value of T shall be (+/-) 25 degree centigrade.

Where *a* = Coefficient of expansion or contraction

L = Length of the member

(DL) = Expansion / Contraction due to temperature variation in appropriate units.

ii) The super-structure is also designed for effects of distribution of temperature across the deck depth. For calculation of thermal forces effect of *E' value of concrete has been taken as 50% of the instantaneous value so as to account for effects of creep on thermal strains.

- **Vehicle Collision Load:**

It is proposed to provide suitable fencing system taking in to account its flexibility having a minimum height of 1.50m above the grade level carriage way and according the piers are designed for residual load component, with vehicles plying with speed limit of 50Kmph, as per art 225.3.1, IRC: 6-2000.

5.4 Design Standards - Roads

Design standards for the Design of Horizontal and Vertical Geometry and other road elements are used referring following guidelines of Indian Roads Congress:

- IRC:37-2001 "Guidelines for Design of Flexible Pavements"
- IRC: 86-1983 "Geometric Design Standards for Urban Roads in Plains"
- IRC: 92-1985 "Guidelines for the Design of Interchanges in Urban Areas"
- IRC: 106-1990 "Guidelines for Capacity of Urban Roads in Plain Areas"
- IRC: 5 – 1998: Specifications and Code of Practice for Road Bridges (Section-I)
- IRC: 6 – 2010: Specifications and Code of Practice for Road Bridges (Loads and Stresses)
- IRC: 112 – 2011: Code of Practice for concrete Road Bridges
- IRC: 78 – 2000: Standard Specifications and Code of Practice for Road Bridges, Section: VII – Foundation and Substructure.
- IS: 456 - 2000 Code of Practice for Plain and Reinforced Concrete
- IS: 2911 (Part I/Sec 2) - 1979 Code of Practice for Design and Construction of Pile Foundations
- IRC: 83 (Part - III) and Part IV : Code of Practice for Road Bridges-Section IX – POT cum PTFE Bearings and Spherical Bearings
- IRC: Sp-65 -2005
- IRC: 86-1985 for Geometrical Designs
- IRC: 37-2012 for Pavement Design
- IRC SP-50 For drainage Design
- IS: 456 - 2000 Code of Practice for Plain and Reinforced Concrete

- SP 16 For IS 456-
- IS: 2911 (Part I/Sec 2) - 1979 Code of Practice for Design and Construction of Pile Foundations
- IRC: 35 for Road Marking
- IRC: 65 for Road Signages

Design standards considered are briefly stated below.

5.5 Geometry

The horizontal geometry will be designed in accordance with Clause 10 of IRC:86-1983. Following considerations are made in horizontal geometry design

- Minimum disturbance to existing structures which are already constructed based on inputs from BBMP in various meetings / discussions.
- To maintain existing road horizontal profile to the extent possible.
- Road widening considered building lines on either side of existing carriageway.
- Rise and fall of existing road in design of the facility;

5.6 Design Speed

The design speed for grade separator in urban stretch is generally governed by the existing road plan and building lines. The most critical sections governing the design speed is the turning movement of vehicles on curves and available sight distance to traffic approaching the junction. Considering above factors, design speed of 40 Kmph is adopted, except at sharp turnings and at exceptional locations where site constrains cannot be avoided.

These constrained locations are considered in alignment design considering ground constraints like building lines, land acquisition and utilities.

5.7 Horizontal Alignment

Horizontal alignment for the grade separator is designed in accordance with IRC:38-1988 "Guidelines of Design of Horizontal Curves for Highways and Design Tables". Clause 10.3 of IRC:86-1983 specifies minimum curve radius of horizontal curve for 50 Kmph as 70m for 4% super-elevation. These guidelines will be followed for reasonably flat and less winding alignments. Depending on site constraints modifications are made for providing tighter curve radius wherever required based on site specific considerations. For ramps, curve radius corresponding to 20 Kmph design speed is proposed.

5.8 Super Elevation on Curves

Super-elevation on horizontal curves will be attained as per IRC: 38-1988. The super elevation will be limited to 4 % as per Cl 10.2 of IRC:86-1983 as the project area is in urban section.

5.9 Cross-Sectional Elements of Grade Separator

Width of grade separator has a direct relationship with the traffic volume it is expected to serve and width available at ground level based on land acquisition. Widths of flyovers / grade separator for various categories are as shown in Table 6-1.

Table 5.9.1 Cross Sectional Elements

Lane Type	Carriageway Width	Kerb & Crash Barrier	Total Width (m)
4Lane (Two way Bi-Direction)	7.5 m	0.5m x 2 sides + 1.0m Median	17.0m

5.10 Surface Level Road

The surface level road will carry local remaining traffic (traffic using shops and commercial establishment, cross road). The width of surface level road will depend on the traffic at the surface level after the flyover is constructed and mostly on space availability. However, for the existing traffic at different sections in the corridor, the lane requirement would be enormous. This involves land acquisition to larger extent considering the highly developed area with many high raised buildings. The footpaths available will have to be re-planned to provide the required space. Therefore, a minimum of 7.5m carriageway at surface level along with 2.0m Drain cum footpath.

5.11 Cross Slope

The deck and approaches is proposed with 2.5% cross slope.

5.12 Vertical Alignment

The vertical geometry of the flyover / underpass is designed as per guidelines given in IRC: 92-1985. Clause 5.1.2 of IRC: 92-1985 states that the vertical gradient should be desirably kept at 4%, but in no case exceed 6%. Vertical curves are provided at locations of change in gradient. The length of vertical curves is dependent on change in grade between two vertical straight and this will be as per IRC SP: 23-1993 "Vertical Curves for Highways".

5.13 Design Basis – Structure

5.13.1 Super Structure.

SL NO	DETAIL	DESCRIPTION
General Arrangements		
1.	Span Arrangement	35.0m for standard viaduct spans, except for adjustable spans 25m and 40m for Obligatory Span Sarakki Junction
2.	Carriage way	Four lane divided carriageway for main arm.
3.	Railing / Median	RCC Crash Barrier on either side or central 1000mm wide RC median.
4.	Overall width of deck.	17.00m for main arm.
5.	Type of superstructure.	PSC Cast in situ Box girder for obligatory span of 40m and PSC Segmental box girder for standard spans and for nonstandard (Adjustable Spans).
6.	Over depth of superstructure.	2.2 to 2.5m depth.

7.	Minimum thickness of deck slab.	250mm
8.	Cross Drainage	2.5%.
9.	Wearing Coat	Stone Matrix Asphalt of uniform thickness 50.00mm.
Loads considered in designs.		
1.	Dead Load	25 kN/m3 for RCC 22.00 kN/m3 for asphaltic wearing coat.
2.	Superstructure live load.	Superstructure designed for IRC:70.R & Class 'A' Vehicle
3.	Load combination	DL + SDL + VhLL.

Material adopted.		
		Concrete –M50 for super structure and M35 for substructure and foundations and Steel – Fe500. Crash Barriers are in M40 Grade Concrete. Low Relaxation Class 2 Strands are proposed For Pre stress steel
Permissible stresses:		
1	In Concrete – Flexural	IRC 112-2011 ((Cl:6.4.2.1 and Table 6.5)
2	Permissible Tensile stresses incase of PSC	As per IRC-112 (Cl:12.1)
	Under Transfer Condition	
	Under Service Condition, with Frequent Combination	As per Table B.3 of IRC 6-2016 (column 3)
	Under Service Condition with Rare Combination	As per Table B.3 of IRC 6-2016 (column 2)
3	Crack Width	As per IRC: 112-2011,(Cl:12.3.4)
4	Flexural Tension	As per Table 6.5 IRC 112-2011
5	Modulus of Elasticity, Ec	As per Table 6.5 IRC 112-2011
6	Permissible Direct Compressive Stress	As per IRC-112 (Cl:12.2.1)

7	Maximum permissible shear stress	As per IRC-112 - 2011(Cl:10.3.2 and 10.3.3)
8	Permissible shear stress without shear reinforcement.	As per IRC-112 - 2011 (Cl:10.3.2)
9	Elastic Modular of Steel	As per IRC-112 - 2011 (Cl:6.2.2)
F	Structural Design	
1	Design will be carried out by limit state method as per IRC-112	
G	**Expansion joint:**	
I	Strip Seal type as per MOST/IRC specifications, also conforming to recent amendments of MoSRT&H, Transport Bhawan, New Delhi.	
H	**Bearing Data**	
I	Type of bearing	POT Cum PTEF/Spherical bearings conforming to IRC 83: (part III/IV), also conforming to recent amendments of MoSRT&H, Transport Bhawan, New Delhi.
I	**General Design Requirements Provided**	
1	Minimum clear cover for any reinforcement	40mm for super structure 75mm for foundation
	Concrete Cover to Post tensioned ducts	75mm
2	Minimum tensile reinforcement in beams	As per IRC:112-2011 (Cl:16.5.1.1)
3	Minimum shear reinforcement	As per IRC-112 - 2011 (Cl:16.5.2
4	Minimum and Maximum reinforcement bar sizes	As per IRC-112 - 2011 (Cl:15.5.2.2)
5	Reinforcement bar spacing	As per IRC-112 - 2011 (Cl:15.2.1)

5.13.2 Substructure

Substructure system.		
Load considered in design.		
1.	Dead loads from superstructure – (G1)	
2.	Superstructure imposed loads from superstructure – (G2)	
3.	Vehicular live load from superstructure – (G3).	
4.	Self Wt of pier system – (G4)	
5.	Braking load from vehicular traffic – (fb)	
6.	Wind loads	As per IRC – 6-2000 for wind speed of 33m /sec.
7.	Seismic effects	FeQ. Zone factor – 0.10 Damping – 5%. Importance factor – 1.2.

5.13.3 Foundation.

SL NO.	DETAILS	DESCRIPTION
Foundation system.		Pile Foundation with Bored Cast in situ Piles as per relevant Codal Practice
Loads considered in design		
1.	Dead loads from superstructure – (G1)	
2.	Superstructure imposed loads from superstructure – (G2)	
3.	Vehicular live load from	

	superstructure – (G3).	
4.	Self Wt of pier system – (G4)	
5.	Self Wt of foundation - (G5)	
6.	Braking load from vehicular traffic – (fb)	
7.	Wind loads	As per IRC – 6-2000 for wind speed of 33m /sec.
8.	Seismic effects	FeQ. Zone factor – 0.10 Damping – 2%. Importance factor – 1.2.
material adopted		M35 grade of concrete & Fe500 grade steel.
permissible stresses		
1.	In concrete flexural compression.	10 Mpa for M30 concrete as per IRC- 112 2011.
2.	Modular ratio for concrete	10.0 As per IRC – 112-2011.
3.	Allowable stress in concrete	200 Mpa for Fe 415 steel as per IRC – 112-2011.
Limit State Design is Adopted for foundation As per IRC- 112.		

5.13.4 General Design Criteria

general design criteria's		
1.	Tension is not allowed under foundation under all loads & load combinations.	
2.	Max allowable pressure under foundation is as per Geotech report and increase is SBC for wind & earth quake considered as per IRC – 78-2000.	
3.	Clear cover for reinforcement	75mm.
4.	Min % of bottom steel of footing.	0.12%.
5.	Min % of Top steel in footing.	360 mm^2 in each direction.
6.	Min % steel in pedestal	0.30%.

5.14 Approach Ramp

It is proposed to adopt "Reinforced Earth" type retaining structure for the approach ramp. The reinforced earth facia wall made of precast concrete panels offers great scope for a variety of aesthetic treatments in the form of panel shapes and colour. Apart from aesthetics, it improves the speed of construction.

Approach gradient of grade separator is primarily dictated by the following.

- Space available in the approach road
- Distance available to nearest major intersection.
- Access for cross roads, bus stops or other important buildings.

Clause 11 of IRC: 86-1983 specifies that the maximum vertical grade in urban area should be limited to 1 in 25. Approach longitudinal gradient of 1 in 30 will generally be attempted for surface level roads to account for the mixed form of traffic present in the city. However in situations, where the ramp length needs to be curtailed due to proximity of adjacent intersection or similar cases, the slope might require to be restricted.

CHAPTER- 6– ALIGNMENT OPTIONS

6.1 General

Traffic data collected at the junction from the traffic survey and its analysis shows that the intersection remains congested for considerable duration of the day. The volume of traffic is expected to increase, as a result of which congestion and delays at the junction increases. This would further lead to increased level of pollution and accidents. It is the right time for taking up necessary measures to reduce the congestion at the intersection by enhancing the capacity/ reducing conflicts and delays at the junction in order to avoid future traffic problems. The capacity of an intersection can be increased by segregating major conflicting traffic movements and segregation of traffic can be achieved by the construction of grade separators.

6.2 Constraints at Site

The following constraints were kept in mind while deciding on the alignment options for improving traffic circulation at Sarakki Junction –

- There are commercial Establishments on either side of the road.
- Existing Metro Lane Cross the ORR along Kanakapura Road.
- Storm Water Drain exist just 200m away from Junction towards JP Nagar.
- There are Major Cross Road Junction exist just 300m way from the junction.

6.3 Alignment Alternatives – 1

OPTION – 1

It is proposed to provide flyover at Sarakki Junction with the Up/ Down ramps on either side of junction to eliminate the through traffic along ORR.

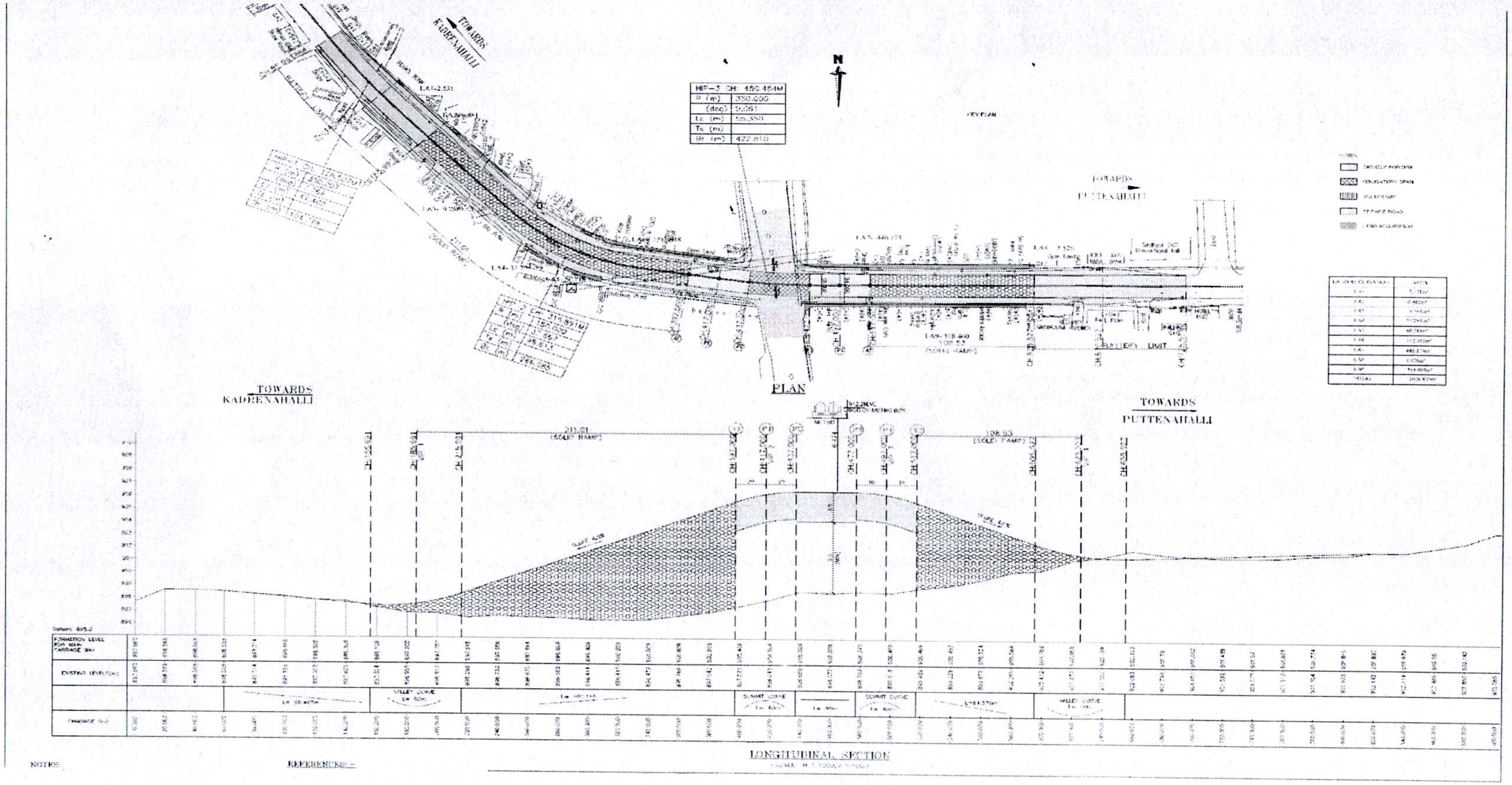
Advantages

1. Reduced V/C ratio at the Surface level road at Sarakki Junction.
2. Decongestion of surface level traffic.
3. Less signal time and queuing length at the Sarakki Junction for surface level traffic.
4. It Reduce the travel time at Sarakki Junction.

Disadvantages

1. Traffic which intends to reach Kadirenahalli from Puttenahalli vice versa shall cross another three junctions, which are become bottle neck after construction flyover at Sarakki junction.
2. The Alignment is required 1027 sqm of Land Acquisition.

OPTION -1 ALIGNMENT



OPTION – 2

It is proposed to provide flyover to Cover Sarakki Junction and 36th Main Road (Sindhoor Conventional Hall Junction) with the Up/ Down ramps on either side to eliminate the through traffic along ORR.

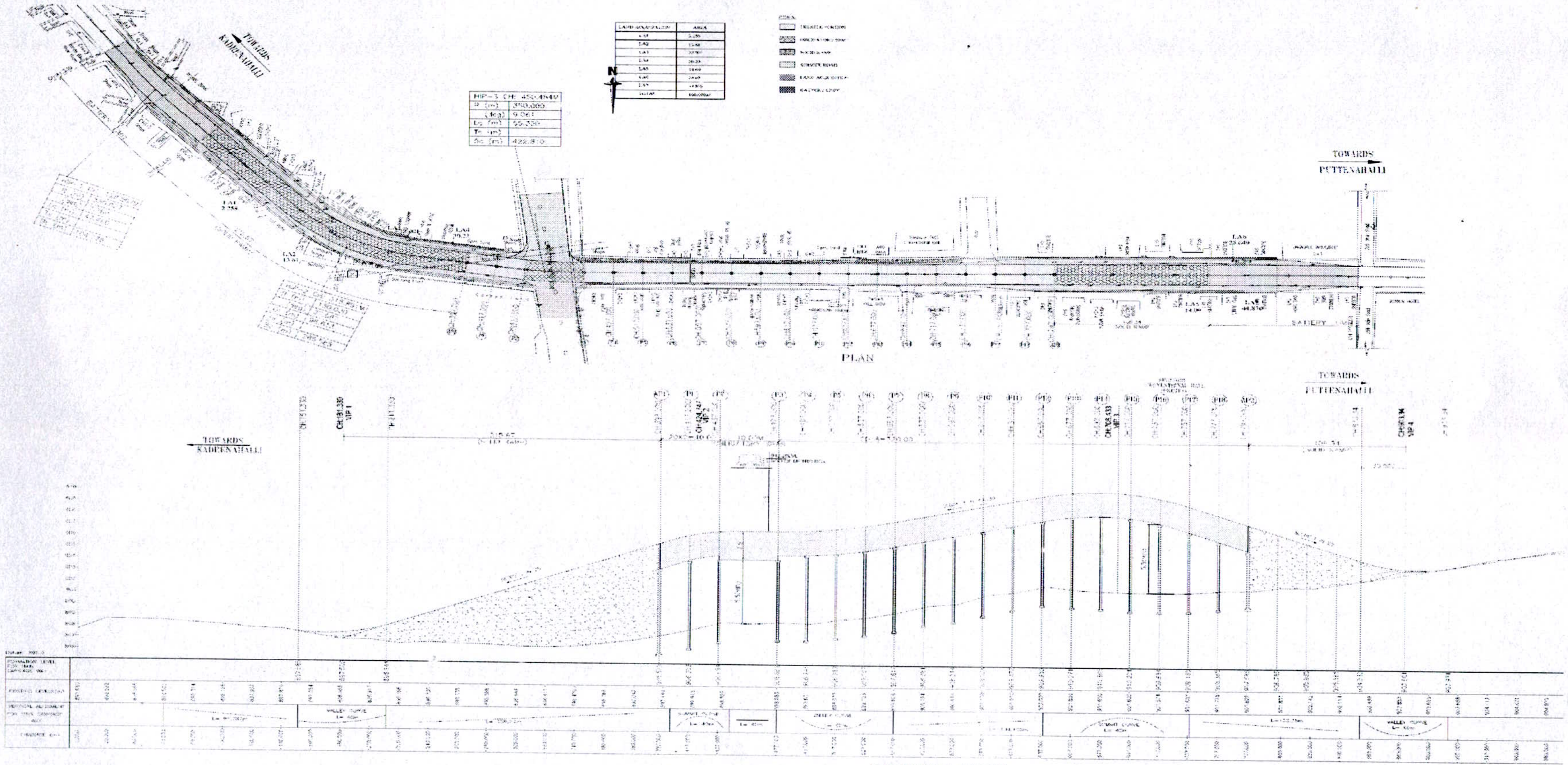
Advantages

1. Reduced V/C ratio at the Surface level road at Sarakki Junction.
2. Decongestion of surface level traffic.
3. Less signal time and queuing length at the Sarakki Junction for surface level traffic.
4. It Reduce the travel time at Sarakki Junction.

Disadvantages

1. Traffic which intends to reach Kadirenahalli from Puttenahalli wise versa shall cross another three junctions, which are become bottle neck after construction flyover at Sarakki junction.
2. The Alignment is required 166.60 sqm of Land Acquisition.

OPTION -2 ALIGNMENT



Option – 3

It is proposed to provide Elevated Road to Cover Sarakki Junction, 36th Main Road (Sindhoor Conventional Hall Junction), 35th Main Road, 33rd Cross and Ilays Nagar Junction with the Up/ Down ramps on either side to eliminate the through traffic along ORR.

Advantages

Reduced C/V ratio at the Surface level road on ORR from Ilyas Nagar to Puttenahalli Junction.

Decongestion of surface level traffic along ORR and Kanakapura Road.

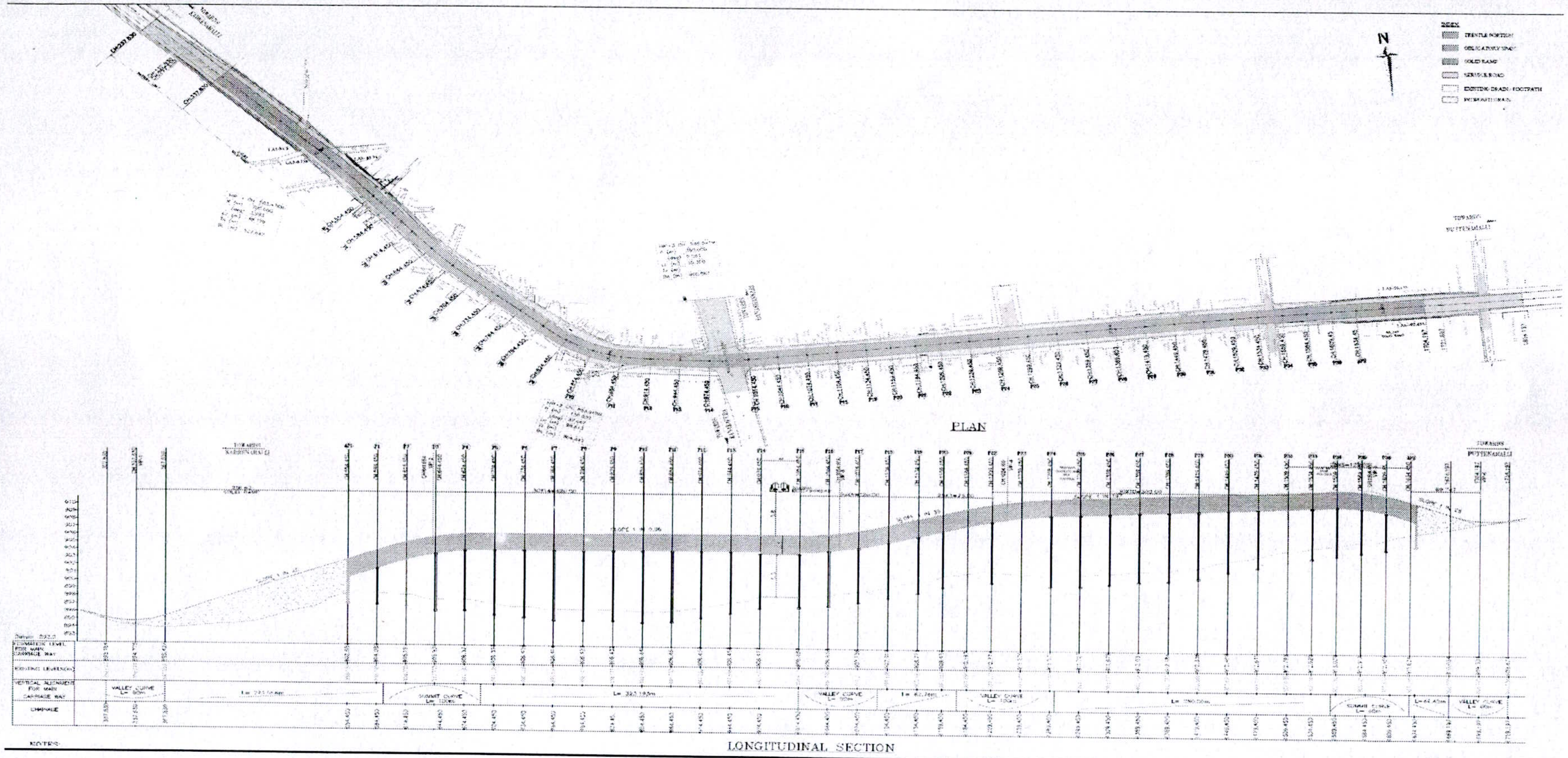
Less signal time and queuing length at the Sarakki Junction and 35th Main Junction for surface level traffic.

Less travelling time along ORR.

Disadvantages

- Construction Cost is more comparing to above both the option.
- The Alignment is required 327.5 sqm of Land Acquisition.

OPTION - 3 ALIGNMENT



Preferred option

From the point of convenience and improvement to the existing traffic and provision of additional lane for the traffic towards South of Bangalore from Kanakapura, Bannerghatta Road, Mysore Road.

OPTION – 3 IS PREFERRED OPTION.

CHAPTER- 7 – STRUCTURAL SYSTEM OF FLYOVER

7.1 General

The proposed project is in the central business area of the city.

The following points are viewed in selecting structural system for the project –

- The Project under study is very important connection to various parts of the city and complete diversion of traffic is not possible.
- The construction method and system shall allow the movement of vehicles during construction period.
- The construction shall be Precast / prefabricated and segmental to minimise the construction period.
- The precast / prefabricated units shall have high strength to weight ratio.
- Easiness of transportation and erection of precast / prefabricated units.

7.2 Options.

Following options are studied –

7.2.1 Option – I: Cast – in - situ. R.C. Construction.

Though R.C.C is the best option from the initial investment point of view, following are the draw backs –

- This requires enormous arrangement of staging, shuttering, concrete production, curing etc.,
- The construction of obligatory span in particular requires elaborate arrangements.
- The noise level during construction period is high.
- Arrangement of "Traffic Management" with cast-in-situ construction is not possible along this corridor with high vehicle density.
- Cast-in-situ construction requires large construction period.

7.2.2 Option – II: Precast PSC Girders

Superstructure:

- Quality control of the element is excellent with precast construction.
- Length of weight of the girders is convenient for easy errection of the Girders.
- Deck slab is cast, with staging over girder only.
- It enables speedy and quality constructions.

7.2.3 Option – III: PRECAST SEGMENTAL PSC BOX.

- The segmental construction with launching girders, allows the traffic at grade level with minimum disturbance.
- The quality of construction will be excellent with form finish.
- This option leads to faster completion of the work.
- With minimum width of bottom slab and flared webs, it adds to the elegance of the structure.

  The piers substructure width is optimised, with above superstructure arrangement, leading to astatically designed pier substructure for the urban environment.

7.2.4 Preferred Option:

Considering minimum inconvenience to grade level traffic during construction, quality of construction, speed of construction and aesthetics, **"PRE CAST SEGMENTAL – PSC BOX" construction (i.e., Option –III) is the preferred option.**

CHAPTER- 8 – TRAFFIC DIVERSION AND MANAGEMENT PLAN

8.1 General.

The existing corridor over which elevated road is proposed is a vital connection to many important locations of the city.

The major roads around this corridor are JP Nagar, Banashankari, Jayanagar, Padmanabhanagar, In view of heavy traffic on the major roads around the corridor and connectively of South Bangalore towards Bannerghatta Road, Mysore Road, KR Road, traffic diversion from the corridor under study is not feasible, hence only "Traffic Management" is to be planned, allowing the vehicle movement along the corridor.

Traffic management is done under following phases –

8.2 Traffic Management during Construction.

8.2.1 Phase – I: Widening and reconstruction of existing carriage way is planned during this phase.

Hard barricading and safety measures are proposed in the construction area, allowing the traffic movement along the existing carriage way –

8.2.2 Phase – II: Construction of Viaduct is planned during this phase.

Hard barricading and safety measures are proposed in the construction area, allowing the traffic movement on either side over existing and extended carriage way.

8.2.3 Phase – III: Construction of obligatory span is envisaged during this phase.

Staging is planned for construction of obligatory span with suitably designed vent ways for allowing traffic movement. Barricading and safety measures to be implemented.

8.2.4 Phase – IV: Reconstruction of grade level roads is planned during this Phase.

The through traffic is allowed over the viaduct. The reconstruction of east and west grade level road along ORR shall be taken up one after the other, to facilitate traffic movement towards cross roads.

The above scheme of traffic management is tentative which is to be approved by the traffic police and the responsibility of approval and implementation rests with construction agency.

CHAPTER – 9 – LEGAL ASSESSMENT

9.1 Land Acquisition

The Project Area lies in Well Developed Residential as well as in Commercial Area. 172.09 Sqm of land needs to be acquired under Transfer of Development Rights (TDR) Scheme for the proposed Grade Separator at Sarakki Junction. Details of Land Acquisition are given in **Drawing No. NC/BBMP/SARAKKI/DPR /Land/01.** There is no Scope for Parking of the Vehicles in Post Construction Scenario of the Project, thus the Project would provide the expected relief to the traffic proposed.

9.2 Enforcement Measures

BBMP has planned to take Precautionary Measures during the Construction Phase to enforce Traffic Diversion and minimizing the effects of various Pollutions. Through the Institutional Framework suggested, BBMP will coordinate with the Traffic Police, BMTC and Utility Operators like BESCOM, BWSSB for the Shifting of Existing Utility Lines, which is going to obstruct the Execution of the Project. Since BBMP is the Obligatory Provider of Citizen Services in the City, it has powers by statue to require other Government and Non Government Agencies to implement Plans in Public Interest.

BBMP has also notified the List of Underpasses and Flyovers that it proposes to construct and thus it is making the Residents and Commercial Establishments aware of the possible disturbances that could emerge on account of the Implementation of the Projects.

CHAPTER – 10 – RISK ASSESSMENT

10.1 In a Road Project there are considerable risks involved during the implementation of the project. The risks during the operation phase are minimal and restricted to over use of the road (against Design Assumptions) by heavier vehicles and damage to road surface by accidents and by vehicles carrying overload. In the current road projects undertaken by BBMP, the time frame for completion varies between 8 to 9 months after mobilization of site resources. The major risk relates to buy in of the project from all stakeholders, especially those affected by the construction itself. These are residential and commercial establishments who are close to the construction site. They are exposed to noise pollution, dust pollution and inconvenience caused due to inability to use their vehicles on account of temporary closure of the roads.

Internal Risks come mainly from three sources: the Project, the Organizations Involved and the Relationships among Partners. Most projects suffer at least temporarily from a deficient project structure: many are launched even though objectives are not clear, a business case had not been completed, and milestones were only vaguely defined, if defined at all. These instances of lack of or inadequacy in definition of scope occur due to pressure to complete the planning stage and to go ahead with the construction early. On the organizational side, lack of project control mechanisms is the factor that most impede many projects. Finally, risks associated with the relationships among partners have been the major source of concern present in all projects, lack of definition of role and responsibility as the most important problem for project implementation.

The Risks associated with the road projects fall into four categories.

- Multiple Stakeholder Coordination Risk during execution of work (very critical in the road projects of Bangalore).
- Project Risk (Clarity in Scope, Clarity in Role and Responsibility).
- Acquisition of Land and Removal of Encroachments while Widening the Drains.
- Shifting of Utilities – Perfect Coordination among the Concerned Stakeholders and the Contractors.

10.2 Stakeholders

The Stakeholders involved in the Bangalore Road Projects are:

- BBMP.
- Utility Companies.
- Traffic Police.
- Public Works Department.
- Residents' Association.
- Shop Owners' Association.
- Pollution Control Board.

10.3 Role of Traffic Police

Coordination with the Traffic Police, Liaison with Residents and Shop Owners' Association is a pre requisite before commencing the Construction Phase. Traffic Police will have to plan for Diversions, Construction of Temporary Structures, and Regulation of Traffic during Peak Hours with Extra Resources, etc. Communication through Media and Door – to – Door Campaign in the affected areas are proposed to ensure smooth Construction Phase.

Traffic Police will also have to develop alternate routing for the BMTC Buses that ply in the roads proposed for revamping. They need to mark the zones near the Construction Site as 'No Parking' and allocate Routes and Space for the Vehicles engaged in the Construction Work.

10.4 Shifting of Utilities

In Bangalore Road Network, the common Utilities that are encountered during the revamping or widening are

- Sewer and Drainage Lines.
- Water Supply Lines.
- Electricity Lines and Structures (Mounted Transformers).
- Telecommunication Lines and Structures.
- Street Lights.
- Parking Signs.
- Post Boxes.
- Signals.

The utilities are to be shifted in coordination with the Concerned Departments. The key is in sending them advance communication and obtaining their sign off for proposed shifting well ahead of the Construction Phase. Underground utilities are the main concern and pose a major challenge that will need the commitment and cooperation of all the associated Departments. Shifting of underground utilities are to be executed in coordination with BWSSB, KPTCL, BESCOM, BSNL and other private Telecom Operators like Bharti, Tata, Reliance, etc., which have led OFC cables along the existing roads.

10.5 Risk Management

Risk	**Stakeholders**	**Severity of Risk**	**Solution**
Acquisition of Land	BBMP, Government of Karnataka	Medium	A Combination of Enforcement and Rehabilitation measures is required to notify the affected people and provide Alternate Arrangements for living. In the case of road projects the instances are minimal.
Removal of Encroachments	BBMP, BDA, Government	Medium	Legislation followed by proper Enforcement; affected people to be

	of Karnataka		considered for Housing under Basic Services to Urban Poor Plan.
Traffic Management	BBMP, Contractors, Traffic Police	High	A Well Coordinated Traffic Management Plan with clearly Defined Roles is required. Participation of Residents and Shop Owners at the Formulation Stage is also recommended.
Risk	**Stakeholders**	**Severity of Risk**	**Solution**
Accident Free	BBMP, Contractors, Traffic Police	Medium	Proper Deployment of Resource at critical periods of time and Inspection of Vulnerable Structures and Traffic Diversion Routes.
Dumping of Construction Debris	BBMP, Contractors	Medium	Storage Space shall be allocated along the Construction Site, Instructions for Clearing and Dumping the Debris Outside the Construction Sites shall be issued.

11.6 Internal Risks associated with Road Projects in Bangalore City with Suggested Measures to Address the Risks

Risks Associated with the Project itself	***Characteristics of Clients / Users of the Service:*** Resistance to Change, Lack of Involvement, Inadequate Education Level, Difficulties in Communicating, Unrealistic Expectations. (To overcome BBMP is seeking Citizen Participation through Ward Committees and others for Buy In the Project and Speedy Implementation). ***Scope of the Project:*** Universality or Specificity of the Service, Number of Partners Involved, Number of Clients, Size of Budget. (Contract Documentation being revamped to define the Role and Responsibility very clearly emphasizing on the need to communicate with the Stakeholders at the Critical Times). ***Complexity of the Project:*** Especially Organizational and Technological Complexity. (Consultant would evaluate various assumptions made in the Design and Detailed Engineering while executing the Project and provide Feedback to BBMP). ***Definition and Structure of the Project:*** Unclear Objectives, Ill Defined Specifications and Functional Requirements, Changes in the Scope or the Reach of the Project, Difficulties in Integrating Data or Processes. (Flexibility to Accommodate Changes by the Contractors included in the Contract Documentation).
Organizational Risks	***Lack of Resources:*** Uncertainty of Funding, Inadequate Resources, Lack of Expertise in Complex Resource Management (these may not be critical under State Govt Funding). ***Project Team Competencies:*** Lack of Experience, Expertise, Stability and Communication Skills. (It is proposed to establish a PMU for Road Projects within BBMP with Requisite Skills and Experience). ***Management Strategy:*** Inadequate or Inappropriate Organizational Support and Control, Absence of a Champion, Lack of Leadership, Unavailability of Tested Management Tools and Processes. (Inter Institutional Committee proposed to deal with Policy Level Decisions including Release of Funds from the State Government). ***Technological Know How:*** Absence of an Adequate Technological Infrastructure and of In House Technological Competencies. (Competencies being Upgraded as well as Latest Construction Practices followed in Road Construction, Material Handling and Disposal of Construction Debris).

Relationship Risks	***Form of Collaboration:*** Inadequate or Inappropriate type of Agreement, Misunderstandings regarding the Content of the Agreement, Inappropriate Selection of Partners, etc. (All Contractual Frameworks to define the Role, Responsibility and Liability of Various Parties clearly; Contractors to be provided with Opportunity to seek Clarification before Accepting the Work). ***Collaborative Process:*** Problems occurring with Coordination, Communications, Inertia, Dependency, Mistrust, Lack of Consensus or Involvement (Change Management Process proposed to be handled by the PMU).

Chapter – 11 – ENVIRONMENTAL AND SOCIAL IMPACTS

In any major developmental initiative aimed at promoting the interests of the community or the State / Country, the Associated Environmental Impacts – whether of a Short Term or Long Term Nature, likely to affect the Environment, Ecology and Health of the Community, need to be seriously examined, before embarking on the proposed project. The Primary Objectives of the Environmental Impact Assessment (EIA) are to evaluate the existing pre operational baseline environmental status at the proposed project site by field studies and data collection, and then carry out an Objective Assessment of the various impacts on the Environment as a result of the proposed activities.

As "Construction of Grade Separator (Flyover) at Sarakki Junction along ORR" is one of the major Metropolitan Infrastructure Projects for Bangalore, it is imperative to conduct an Environmental Impact Assessment (EIA) to quantify the Benefits accrued to the Community as a result of the Project, while at the same time analyzing carefully the Impact Aspects due to the Project itself, during Construction and Operation Phase Cycles. As these Data are crucial for the Planning and Successful Implementation of the Project, Various Data (such as Nos. of Tree Cutting, Extent of Air and Noise Pollution, etc.) have been collected from extensive site studies in accordance with well established Standard Procedures.

The existing road infrastructure on ORR have deteriorated remarkably as a result of lack of investment and multifold increase in traffic volume and have to be upgraded to higher service levels in order to reduce transport cost in support of Socio Economic Development.

Discussions held with Government and Non Governmental Organizations and a Detailed Site Assessment have been carried out to provide the basic background for Impact Identification and Assessment. A Scoping Exercise has also been carried out at the Pre Construction Stage to identify and highlight the Key Issues and Impacts likely to occur during the Construction, Operations and Maintenance Phases of the Project, as well as to identify those Impacts which could, but are unlikely to occur. Practical and Cost Effective Benefit Enhancement and Mitigation Measures have been identified and outlined, taking into account alternative approaches that are appropriate to the situation. A Management and Monitoring Plan was developed to provide a sound basis for ensuring that the specified benefit enhancement and mitigation measures are fully adopted.

For Planning and Implementation of "Flyover", we have given due attention to the Environmental and Social Issues. The Various Issues addressed under this Section are as follows.

11.1 Environmental Impact

11.1.1 Green Cover

Bangalore City – with its rich flora and abundant green cover and being host to Lalbagh and Cubbon Park, which are renowned botanical gardens, is rightly called the "Garden City of India". Bangalore City bagged the Central Government sponsored "Indira Priyadarshini Vruksha Mitra" Award in the late 1980s in recognition of its extensive green cover. But today, lung space is shrinking in the city and core areas have lost green cover with increase in concrete structures. As a part of this project, to acquire obstruction free area, 97 trees to be cut in the project area. Considering the Benefits of the Project and the Compensatory Afforestation Plan envisaged, it has been observed with management plans consisting of planting of trees in the ratio of 1:2, proactive afforestation for green cover and development of green ribbon in and around the project area, it will be abundantly compensating the green cover.

11.1.2Air Pollution

Air Pollution level will go up during the Construction Stage due to operation of construction yards, material transport on trucks and due to heavy earth moving machinery exhaust emissions (e. g. SPM, RSPM, NO_x, SO_x, CO, etc.) from the construction sites. These are not permanent in nature, but minor, temporary and mitigeatable. In the post construction scenario, the General Level of Air Pollution in the project area will be significantly less than the current level due to improved movement of vehicular traffic and removal of idling time and thus this project ensures better environment. The Consultant has collected data regarding existing Air Quality in and around the project area and is given **Table 11.1.** All vehicles delivering materials to the site will be covered to avoid spillage of materials. All existing highways / roads used by vehicles of the Contractor, or any Sub Contractor or Suppliers of Materials or Plant and similarly Roads, which are part of the Works, will be kept clean and clear of all dust / mud or other extraneous materials dropped by such vehicles. The unloading of materials at construction sites close to settlements will be restricted to night time only. Vehicles and Equipment will be fitted with Exhaust Silencers. During routine service operations, the Effectiveness of Exhaust Silencers will be checked and if found defective will be replaced. Unpaved Haul Roads near / passing through residential and commercial areas to be watered thrice a day. Trucks carrying construction material are to be adequately covered. All Earthworks will be protected in a manner acceptable to the Engineer (such as Barricading the Construction Site) to minimize Dust Nuisance in the surrounding area. The Contractor will take every precaution to reduce the Level of Dust along Construction Sites involving Earthworks, by frequent application of water.

Table 11.1

At Sarakki Junction

Ambient Air Quality Monitoring

Type of Monitoring	**Ambient Air Quality**
Duration of Sampling	**24 hrs.**
Instrument used for Monitoring	**Respirable Dust Sampler APM 460 & 411.**

Descriptions	**Value in µg / m^3**	
	Existing	Permissible
Respirable Particulate Matter	**164.0**	120.0
Suspended Particulate Matter	**419.0**	360.0
Oxides of Sulphur	15.8	80.0
Oxides of Nitrogen	40.2	80.0

11.1.3 Water and Soil pollution

The Surface and Underground Water and Soil Pollution Aspects are not likely to be greatly influenced, unlike Air Pollution Quality by the Construction of Flyover at Sarakki Junction However, there could be Indirect Impact on the Water and Soil Components in the long run.

As the Project Activities need substantial water quantities for construction processing, dust proofing, cleaning of vehicles and batch mixing, etc. there could be considerable demands on water resources available. Necessary arrangements and contingency plans with BWSSB and Arrangement for Supply of Recycled Water should be made to meet the Water Demands, without in anyway affecting the city's normal water supply demands.

All the Proposed Project Components will be in Well Developed Areas of the City with Distinct Land Usage Patterns ranging from Residential to Commercial Activities under Well Established Conditions. As Construction Activities are primarily land based, many Impacts can be identified in the Soil Component in the Proposed Area. Excavation Activity will produce a lot of rubble from excavated soil, needing disposal. The excavated soil / debris will be disposed by covered trucks to avoid Dust Nuisance in the Project and Surrounding Areas. Debris generated due to the dismantling of the existing pavement structure shall be suitably reused in the Proposed Construction, subject to the Availability of the Material and the Approval of Project Engineer. The Contractor shall suitably dispose of Unutilized Debris Material; either through filling up of Borrows Areas created for the Project or at Pre Designated Dump Locations, subject to the Approval of the Project Engineer. Debris generated from different Construction Activities shall be disposed of in such a way that it does not flow into the Surface Water Bodies or form Mud Puddles in the area.

11.1.4Noise Pollution

As the Project involves significant uses of Heavy Machineries, Traffic Diversion, etc. hence Noise Concern will be a major issue during Construction Phase. But the Post Construction Scenario ensures a Better Environment in the Project Area, as the General Level of Noise Pollution in the Project Area will be significantly less than the Current Level due to Improvement in the Movement in Vehicular Traffic and Removal of Idling Time. The Consultant has collected existing Noise Level Data in and around the Project Area and is given **Table 11.2**. To mitigate the Noise Impact, Direct Technical Remedies including Low Noise Road Surface, Road Covers and Roadside Noise Barriers will be provided. Noise Limits for Construction Equipment used in this Project (measured at one metre from the edge of the equipment in free field) such as Compactors, Rollers, Front Loaders, Concrete Mixers, Cranes (movable), Vibrators and Saws will not exceed 75 dB (A), as specified in the Environment (Protection) Rules, 1986. Notwithstanding any other Conditions of Contract, Noise Level from any Item of Plant (s) must comply with the Relevant Legislation for Levels of Noise Emission. The Contractor will ensure that the AAQ Concentrations as these Construction Sites are within the Acceptable Limits of Industrial Uses in case of Hot Mix Plants and Crushers and Residential Uses around Construction Camps. Noisy Construction Operations in Residential and Sensitive Areas (Hospitals, Schools and Religious Places) should be restricted between 0730 hrs. and 1800 hrs. Preventive Maintenance of Construction Equipment and Vehicles would be done to meet Emission Standards and to keep them with Low Noise. Earplugs will be provided to Operators of Heavy Machinery and Workers in near vicinity. Material Transport should be uniformly distributed during nights to minimize Noise Impacts.

Part of the Costs, particularly the Implementation of Environmental Measures is included in the Unit Rates for the Works and is responsibility of the Contractor.

Table 11.2

At Sarakki Junction

Existing Noise Level Monitoring

Instrument used for Monitoring **Sound Level Meter Lorton SL – 4001**

Permissible Limits **75 dB (A) – Day Time**
70 dB (A) – Night Time

Sl. No.	**Time Interval**	**Noise Level in dB (A)**
1	0600 hrs. to 0700 hrs.	71.9
2	0700 hrs. to 0800 hrs.	72.3
3	0800 hrs. to 0900 hrs.	72.9
4	0900 hrs. to 1000hrs.	73.5
5	1000 hrs. to 1100 hrs.	73.7
6	1100 hrs. to 1200 hrs.	72.1
7	1200 hrs. to 1300 hrs.	71.1
8	1300 hrs. to 1400 hrs.	71.6
9	1400 hrs. to 1500 hrs.	71.5
10	1500 hrs. to 1600 hrs.	71.4
11	1600 hrs. to 1700 hrs.	72.1
12	1700 hrs. to 1800 hrs.	72.4
13	1800 hrs. to 1900 hrs.	73.4
14	1900 hrs. to 2000 hrs.	73.2
15	**2000 hrs. to 2100 hrs.**	**72.3**
16	**2100 hrs. to 2200 hrs.**	**72.1**

11.1.5Social Impact

The Direct and Indirect Job Opportunities that will be provided by the Project can be considered as a Positive Aspect. The Local People will be directly employed to work at the Construction Sites and others will be employed in Sectors of the Economy, which have been developed by the Road such as the Service Sectors. Some individuals may gain skills that can be applied in other Road Construction Projects.

Contract Documentation will be crafted in such a way that the Construction Work does not cause undue Inconvenience to Residents, especially the Sick and Old People. Removal of Construction Debris promptly from the Site falls within the Scope of Work of the Contractor. Asphalting, the Major Work, involved in the Road Construction would invariably be carried out during the nights with Proper Inspection Team supervising the Process.

The table below summarizes the Negative Environmental and Social Impacts and Mitigation / Benefit Enhancement Measures for the Negative Impacts, as well as the responsible body to implement the measures.

Type of Impact	Mitigation Measure	Responsible Body for Implementation
Impact on Settlement	Minimize the Risk at the Road particularly in a Dense Settlement Area.	Consultant and Contractor.
	Allow Affected Persons to Salvage Building Materials and other Assets.	BBMP and Contractor.
	Pay Compensation and Resettle the Affected People.	BBMP.
Impact on Health	Do not Induce Water Related Diseases by creating Temporary and Permanent Water Holding Areas, which favour Mosquitoes.	BBMP and Contractor.
	Minimize Dust Emission by Watering the Road during Construction.	Contractor.
	Put Visible and Appropriate Warning Signs on the Road during Construction.	Contractor.
Impact on Existing Infrastructure	Relocate Power Lines, Telephone Lines and Water Points before Commencing of the Road Construction and in few cases during the Construction Phase.	Utility Companies and Contractor.
Impact on Cultural, Religious and Archeological Resources	Design Roads to avoid such Sensitive Places.	Design Consultant.
Road Safety during Construction and Operation Phase	Install Road Safety Signs at all Accident Prone Spots as Installation / Erection of Safety Signs.	Traffic Police / Contractor.
	Provide Traffic Awareness.	Contractor in collaboration with Traffic Police of the Area and Local NGO.

	Use Clear, Properly Labelled and Meaningful Traffic Signs and Speed Limits, especially at Pedestrian Road Crossing.	Contractor in collaboration with Traffic Police of the Area.
	Assign Traffic Personnel to regulate the Passage of Construction Vehicles (carrying debris as well).	Contractor in collaboration with Traffic Police of the Area.
	Construct Half of the Road while the other is used for Traffic where feasible.	BBMP and Contractor.
Social Impact from Migrant Workers	Construction Workers will be given Health Awareness.	NGOs in collaboration with the Contractor.
	Avoid accommodating Labour Force in or directly adjacent to Construction Sites.	Contractor.
	Recruit Work Force from the Local Community giving more chances to Women.	BBMP and Contractor.

CHAPTER – 12 – PARTICIPATION OF BENEFICIARIES

- Any Infrastructure Development Activities of BBMP are planned and implemented through Community Participation Process. Local Government Institutions at various levels are involved in the Implementation of Projects. Moreover, NGOs are involved to assist BBMP in Social Mobilization Aspects for Planning and Implementation of the Project. As a part of Participatory Development, Beneficiary Groups and User Committees, such as Labour Contracting Society, Market Management Committee, Road User's Committee, Water Management Committee, etc. have been consulted under various Projects of BBMP. Involvements of the Private Sector, Local Government Institutions, NGO and Beneficiary Groups have significantly contributed to Smooth Planning, Implementation and Operation / Maintenance of Infrastructure Development Schemes of BBMP at the Local Level. Consultation with various Stakeholders has been an Integral Part of Project Formulation Phase. People have been interviewed along the route, including Elders and Elected Members of the Community; have given a positive reaction to Road Improvement. The Project Junction is very important in terms of connecting the National Highways. Social Acceptability of the Project Junction is very high.

- This Project will have many Positive Impacts on Beneficiary Livelihoods and in the Potential Economic Expansion of the Region. Beneficiaries of this Project include Bangalore Metropolitan Transport Corporation (BMTC) Authority, Commuters using this stretch of road, Local People in and around of the Project Area.

- Public Opinion with regard to public projects cannot be ignored. It plays a very important role in the decision making process. Given the chaotic road traffic on ORR, Public Opinion Survey has been conducted on the basis of a sample of cross section of intelligentsia drawn from Lawyers, Doctors, Engineers, Academicians, Journalists, etc. the Opinion Makers in Urban Situation. Interactive Sessions with NGOs and Various Members of the City Public also formed part of the Exercise in this Direction.

- Prior Information to the Public, before the Start of the Work, regarding the Project will be given through Paper Notification.

- Boards, comprising Important Data regarding the Project (such as Project Name, Name of the Agency executing the Work, Name of Local Government Body taken up the Project, Date of Commencement of the Project, Projected Date to Complete the Work, etc.) for notifying people will be displayed at the major junctions in and around the project area.

- Adequate actions to direct and regulate traffic shall be taken in consultation with BBMP / Traffic Police to prevent jamming roads during Construction Period. While planning alternative routes, care to be taken to minimize congestion and negative impacts at sensitive receptors such as Schools and Hospitals. Traffic Controls and Diversions marked with Signs and Lights and Other Measures (flags) should be provided. Prior to creating Diversions and Detours, the citizens will be consulted well in advance through Citizen's Meetings. It should be an informed decision taken through Public Participation. The Temporary Traffic Detour will be cleaned regularly.

- Another significant aspect of the Construction of Flyover at Sarakki Junction would be its Dislocation Effect on the existing public utilities like Electrical System Network (including Street Lighting), Sewerage Lines and Water Supply Network, etc. As the Public Utility Network are very vital for a normal functioning of an Urban Metropolis, a Detailed Survey of Existing Utilities and their Diversion or Reinstallation on a temporary or permanent basis should be planned in a proactive manner and organized with minimum loss of time and inconvenience to the community. Prior Information through Paper Notification will be given to the affected area people before shifting any Utilities.

- The Project is judged to be environmentally and socially acceptable.

Chapter- 13 – CONCLUSIONS AND RECOMMENDATION.

13.1 Conclusions

The Project is found to be economically viable. Therefore the construction of Flyover at Sarakki Junction along ORR coupled with the traffic management will have the following additional benefits:

- Reduced junction delays and Vehicular Pollution
- Reduction in idle fuel consumption
- Improved level of service at the Junction
- Substantial savings in travel time of Road users
- Reduces the number of conflicts.

13.2 Recommendations.

- It is expected that the LOS of the flyover will reduce with the increase in traffic. To improve the same, other junction along the radial arms of the junction needs to be coordinated in order to reduce the congestion at these junctions. Improving the LOS of these junctions will also improving the public transport system will improve of LOS of the flyover at a later stage.
- Maintenance overlay needs to be provided on the main carriageway once every 5 years to improve the functional and structural soundness of the pavement.

APPENDIX – 1.

DETAILED COST ESTIMATE

BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
1.00	**SITE CLEARANCE AND DISMANTLING**								
1.01	KSRRB 200-2. Cutting of trees girth from 600mm to 900mm includingcutting of trunks, branches and removal of stumps roots stacking of serviceable materials earth filling in the depressions / pit, labour charges complete as per specifications. MORTH specification clause 201/ Chapter 2	Each							
	(P.No.138, I.No.18.2 of PW,P&IWTD S.R 2018-19)		--	--	--	--	**40**	995.76	**39,830.40**
	Basic Rate	922.00							
	Area Weightage	73.76							
	Total	995.76							
1.02	KSRRB 200-4. Cutting of trees girth from 1800mm to 2700mm includingcutting of trunks, branches and removal of stumps roots stacking of serviceable materials earth filling in the depressions / pit, labour charges complete as per specifications. MORTH specification clause 201/ Chapter 2	Each							
	(P.No.138, I.No.18.4 of PW, P&IWTD SR 2018-19)								
			--	--	--	--	**10**	3768.12	**37,681.20**
	Basic Rate	3,489.00							
	Area Weightage	279.12							
	Total	3,768.12							
1.03	KSRRB M200-15.2. Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts complete as per specifications. iii) Dismantling Stone Masonry. MORTH Specification No. 202 Rubble stone masonry in cement mortar.	Cum							
	(P.No.140, I.No.18.23 of PW,P&IWTD S.R 2018-19)								
	Drain Bed								
	LHS Side		2	376.62	1.50	0.10	112.99		
	RHS Side		2	194.75	1.50	0.10	58.43		
	For Drain wall								
	LHS Side		4	376.62	0.15	1.00	225.97		
	RHS Side		4	194.75	0.15	1.00	116.85		
							514.23		
						Say	**514.50**	379.08	**1,95,036.66**
	Basic Rate	351.00							
	Area Weightage	28.08							
	Total	379.08							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
1.04	KSRRB M200-15.2 Rubble stone masonry in cement mortar (P.No.140, I.No.18.27 of PW,P&IWTD S.R 2018-19)								
	Compound wall		2	240	0.45	1.5	324.00		
						Say	324.00	379.08	1,22,821.92
	Basic Rate	351.00							
	Area Weightage 8%	28.08							
	Total	379.08							
1.05	KSRRB M200-27. Dismantling of Kerb stone by manual means including and disposal of dismantled material with all lifts and complete as Per specifications MORTH Specification No. 202 (P.No.141- I.No.18.50)	Rm							
	Kerbs at footpath		2.00	571.37			1,142.74		
	Central Median		2.00	1,426.00			2,852.00		
					Total		3994.74	12.96	51,771.23
	Basic Rate	12.00							
	Area Weightage @8%	0.96							
	Total	12.96						Total	4,47,142.01

Assistant Executive Engineer
Project (Central - 3), Sub-Division
Bruhath Bengaluru Mahanagara Palike
Bangalore - 560 002

Executive Engineer
Project Central - 3
Bruhath Bengaluru Mahanagara Palike

Nagesh Consultants
No. 2,
6th Cross,
Ashoknagar,
BSK 1st Stage
Bangalore-560 050

BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
2.00	**SURFACE LEVEL ROADS/ SLIP ROADS**								
2.01	**KSRRB M300-14.Excavation for road work in all types of soil by mechanical means** including cutting and loading to tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transportation with a lead of 1.00km and complete as per specfications. Morth Specification No. 301	Cum							
	(P.No.143, I.No.19.14 of PW, P & IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	0.58	1,949.01		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	0.58	1,007.83		
							2,956.84		
						Say	**2,957.00**	44.28	**1,30,935.96**
	Basic Rate	41.00							
	Area Weightage	3.28							
	Total	44.28							
2.02	KSRRB M100-4.2. **Haulage** of materials by tipper including cost of loading, unloading and stacking complete as per specifications. MoRT&H Chapter 1 Case-I : Surface Road ,	Cum							
	(P. No.136,I.No17.5 of PW, P&IWTD S.R 2018-19)								
	Qnty same as item no 2.01 (dumping yard Anjanapura)								
	For 14Km Rs. 2.0 X 1.28 X 14 = 35.84		1.00	2,957.00	--	--	**2,957.00**	38.71	**1,14,456.60**
	Basic Rate	35.84							
	Area Weightage	2.87							
	Total	38.71							
2.03	KSRRB M400-7 Construction of granular sub-base Grading V as Sub-base and draiage layer by providing coarse graded crushed stone aggregates of granite/trap/basalt material, mixing by mix in place method by rotavator at OMC, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the 98% proctor density, complete as per specifications. Clause 401 of MORTH V revision.	Cum							
	(P.No.153, I.No.20.6 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	0.20	677.92		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	0.20	350.55		
							1,028.47		
							1,028.50	1,890.00	**19,43,865.00**
	Basic Rate	1,750.00							
	Area Weightage	140.00							
	Total	1,890.00							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
2.04	KSRRB M400-17. Providing laying, spreading and compactingCrushed stone aggregates of granite/trap/basalt to Wet mix Macadam specifications including pre mixing the material with water at OMC in mechanical mix plant carriage of mixed materials by tipper to site, laying in uniform layers with paver in sub-base/base course on well prepared surface and compacting with vibtatory rollers to achieve the desired density complete as per specifications. MORTH specification No 406	Cum							
	(P.No.155, I.No.20.18 PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	0.25	847.40		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	0.25	438.19		
							1,285.58		
						Say	**1,286.00**	2,039.04	**26,22,205.44**
	Basic Rate	1,888.00							
	Area Weightage	151.04							
	Total	2,039.04							
2.05	KSRRB M500-6. Providing and applying **Primer coat with S.S bitumen emulsion** on prepared surface of granular Base such as WMM including clearing of road surface and spraying primer at the rate of 0.60 kg/sqm using mechanical means complete as per specifications. MORTH Specification No.502	Sqm							
	(P.No.158, I.No.21.6 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	--	3,389.58		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	--	1,752.75		
							5,142.33		
						Say	**5,142.50**	30.24	**1,55,509.20**
	Issue Rate dated 02.07.2020	28.00							
	Area Weightage	2.24							
	Total	30.24							
2.06	KSRRB M500-17. Providing and laying dense graded bituminous macadam using crushed aggregates of specified grading, premixed with VG30 grade bituminous binder and, transporting the hot mix to work site, laying to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications.Clause 505 of MORTH V revision - do - using 40/60 TPH capacity H.M.P. with Mechanical paver Gr-II(50 mm to 75 mm) with 4.5 % VG-30 Bitumen	Cum							
	(P.No. 160 I.No.21.17.6 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	0.085	288.11		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	0.085	148.98		
	Profile correction course (5.5m width 30% Considered)		2.00	1,511.37	1.65	0.085	423.94		
	Resurface of Cross Roads - 50m								
	LHS								
			2.00	50.00	8.50	0.085	72.25		
	RHS								
			2.00	50.00	7.50	0.085	63.75		
	Profile correction After Construction		2.00	1,522.68	3.50	0.05	532.94		

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
							1,529.97		
						Say	**1,530.00**	6,528.60	**99,88,758.00**
	Issue Rate Date 02.07.2020	6,045.00							
	Area Weightage	483.60							
	Total	6,528.60							
2.07	KSRRB M500-7: Providing and applying **tack coat on the prepared black topped** surfaces at 2.5kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM of machineries complete as per specifications. MORTH Chapter 5	Sqm							
	(P.No.158 I.No.21.7 of PW,P&IWTD SR of 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	4.50	--	3,389.58		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	4.50	--	1,752.75		
	Profile correction course (5.5m width 30% Considered)		2.00	1,511.37	1.65	--	4,987.51		
	Resurface of Cross Roads - 50m								
	LHS								
			2.00	50.00	8.50	--	850.00		
	RHS								
			2.00	50.00	7.50		750.00		
	After Construction		2.00	1,522.68	7.00		21,317.52		
							33,047.36		
						Say	**33,047.50**	12.96	**4,28,295.60**
	Basic Rate	12.00							
	Area Weightage	0.96							
	Total	12.96							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
2.08	Providing and laying bituminous concrete 40mm thick with hot mix plant, using crushed aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site, laying with a paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications. Clause 507 of MORTH V revision as per IRC SP 53-2015. – do – using 40-60 TPH capacity HMP with mechanical paver grading II (30-45mm) with 5.4 % of modified bituminus binder consisting of 4.97%of VG-30 bitumen (60/70 grade) and 0.43% of plastomeric thermoplastics (waste plastic)	Cum							
	(P.No.171 of I.No.21.78.12 in PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli (ch:237.83 to 614.45)		2.00	376.62	5.50	0.04	165.71		
	Towards Puttenahalli (ch:1554.45 to1749.20)		2.00	194.75	5.50	0.04	85.69		
	Resurface of Cross Roads - 50m								
	LHS								
			2.00	50.00	8.50	0.04	34.00		
	RHS								
			2.00	50.00	7.50	0.04	30.00		
	After Construction		2.00	1,522.68	7.00	0.04	852.70		
							1,168.10		
						Say	1,168.50	7,679.88	89,73,939.78
	Issue rate date 02.07.2020	7,111.00							
	Area Weightage	568.88							
	Total	7,679.88							
								TOTAL	2,43,57,965.58

Assistant Executive Engineer
Project (Central - 3), Sub-Division
Bruhath Bengaluru Mahanagara Palike
Bangalore - 560 002

Executive Engineer
Project Central - 3
Bruhath Bengaluru Mahanagara Palike

Nagesh Consultants
No. 2,
6th Cross,
Ashoknagar,
BSK 1st Stage
26617865
26617866
Bangalore 560050

BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
3.00	**DRAIN WORKS**								
	a) For Road side Drains								
3.01	**KSRRB M300-11. Excavation** for road way in soil **by mechanical means** including cutting and pushing the earth to site of embankment upto a distance of 100 meters (average lead 50 meters), including trimming bottom and side slopes in accordance with requirements of lines, grades and cross sections complete as per specifications. MoRT&H Specification No. 301	Cum							
	(P.No.143, I.No.19.14 of PW, P & IWTD S.R 2018-19)								
	Kadrenahalli		2.00	376.62	1.50	1.30	1,468.82		
	Puttenahalli		2.00	194.75	1.50	1.30	759.53		
							2,228.34		
						Say	**2,228.50**	44.28	**98,677.98**
	Basic Rate	41.00							
	Area Weightage	3.28							
	Total	44.28							
3.02	KSRRB M2100-10. Providing and laying Plain cement concrete of mix 1:3:6 with OPC @ 220kgs, with crushed 40mm and down size graded granite metal coarse aggregates @0.89cum and fine aggregates @ 0.46cum, in foundation mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 2100	Cum							
	(P.No.222, I.No.27.18 of PW,P&IWTD S.R 2018-19)								
	For Drain Bed								
	Kadrenahalli		2.00	376.62	1.50	0.10	112.99		
	Puttenahalli		2.00	194.75	1.50	0.10	58.43		
							171.41		
						Say	**171.50**	5,613.28	**9,62,676.83**
	concrete **Basic** Cost	5,115.00		**old**					
	Cement content	220.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,079.39							
	Cost Excluding Cement	4,035.61							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	220.00	kg						
	Cost of Cement	1,161.86							
	Basic new cost of concrete	**5,197.48**	**Cum**	NEW					
	Basic Rate	5,197.48							
	Area Weightage	415.80							
	Total	5,613.28							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
3.03	Providing and laying plain/ reinforced cement concrete for side drains using M20 nominal mix concrete with OPC at 300 kgs. With 20mm and down size granite metal coarse aggregates at 0.69 cum and fine aggregates at 0.43 cum machine mixed, well compacted for walls and bottom including centering shuttering, cost of materials, HOM of machinery, curing etc., complete excluding cost of steel as per MORTH specification No.1500, 1700, 2200 includig cost of materials, labour, HOM complete as per specifications. wall and bottom thickness 15cm.	Cum							
	(P.No.271, I.No.37.59.2 of PW, P& IWTD SR 2018-19)								
	For Drain Bottom slab								
	Kadrenahalli		2.00	376.62	1.50	0.15	169.48		
	Side Walls								
	Kadrenahalli		4.00	376.62	0.15	1.00	225.97		
	Puttenahalli								
	Bottom Slab		2.00	194.75	1.50	0.15	87.64		
	Side Walls		4.00	194.75	0.15	1.00	116.85		
	Top slab for Cross Roads		1.00	50.00	1.50	0.20	15.00		
							614.94		
						Say	**615.00**	7,203.60	**44,30,214.00**
	Basic Rate	6,670.00							
	Area Weightage	533.60							
	Total	7,203.60							
3.04	KSRRB M2200 - 6. Supplying, fitting and placing **TMT bar reinforcement in sub - structure** complete as per drawing and technical specifications complete as per specifications. MORTH Specification No. 1600 & 2200	MT							
	(P.No.229, I.No.28.8.2 of PW, P&IWTD SR 2018-19)								
	Steel at 70 kg/cum		1.00	615.00	--	--	43.05		
						Say	**43.50**	66,274.20	**28,82,927.70**
	Basic Rate	61,365.00							
	Area Weightage	4,909.20							
	Total	66,274.20							
3.05	Providing and fixing **RCC Precast cover slab** of **100mm thick** for drain in cement concrete 1:1.5:3 using graded granite jelly 20mm and down size with steel reinforcement, including form work, lift charges, curing and concrete finished surfaces on both sides etc, complete and as per the directions of Engineer in-Charge.	Sqm							
	(P.No.272, I.No.37.66 of PW, P&IWTD SR 2018-19)								
	Drain Cover Slab								
							1,092.74		
		Sqm					1,092.74		
		RM					728.49		
						Say	**728.49**	1,751.22	**12,75,752.10**
		RM							
	800 wide slab	**1,081.00**							
	1.5 wide slab	**1,621.50**							
	Basic Rate	1,621.50							
	Area Weightage	129.72							
	Total	1,751.22							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
3.06	KSRB 14.6 : Providing and laying heavy duty cobble stones interlock pavers, using cement and course sand for manufacture of blocks of approved size, shape and colour with a minimum compressive strength of 281 kg per sqm over 50mm thick sand bed (average thickness) and compacting with plate vibrator having 3 tons compaction force thereby forcing part of sand underneath to come up in between joints, final compaction of paver surface joints into its final level, including cost of materials, labour and HOM complete as per specifications. Specification No. KBS -**heavy duty cobble stones 60mm thick**	Sqm							
	(P.No.103, I.No.14.6.1 of PW,P&IWTD S.R 2018-19)								
	For footpath								
	Kadrenahalli		2.00	376.62	0.50		376.62		
	Puttenahalli		2.00	194.75	0.20		77.90		
							454.52		
						Say	**455.00**	1,137.24	**5,17,444.20**
	Basic Rate	1,053.00							
	Area Weightage	84.24							
	Total	1,137.24							
3.07	KSRB 2.3: Filling **available Excavated Earth (excluding rock)** in sides of foundations upto plinth in layers not exceeding 20cms in depth, compacting each deposited layer by ramming after watering with lead upto 50m and lift upto 1.5 m including cost of all labour complete as per specifications. Specification No.KBS 2.9	Cum							
	(P.No.7, I.No.2.10 of PW, P&IWTD S.R 2018-19)								
			2.00	376.62	0.10	1.30	97.92		
			2.00	194.75	0.10	1.30	50.64		
							148.56		
						Say	**149.00**	217.08	**32,344.92**
	Basic Rate	201.00							
	Area Weightage	16.08							
	Total	217.08							
3.08	KSRRB M100-4.1. Cost of Haulage including Loading and Unloading of Stone Boulder / Stone aggregates / Sand / Kanker / Moorum.Placing tipper at loading point, loading with front end loader,dumping , turning for return trip, excluding time for haulage and return trip complete as per specifications. MORTH-100/ Chapter 1 Case-I : Surface Road	Cum							
	(P.No.136, 17.1/17.4 of PW, P&IWTD SR 2018-19)								
	Qnty same as item no 3.01- 3.06 **(dumping yard Anjanapura)**								
	For 14Km Rs. 2.0 X 1.28 X 14 = 35.84		1.00	2,079.50	--	--	**2,079.50**	38.71	**80,491.21**
	Basic Rate	35.84							
	Area Weightage	2.87							
	Total	38.71							
	b) Re-Construction of Compound								

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
3.09	KSRRB M300-14. Excavation for roadwork in all types of soil by mechanical means including cutting and loading to tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transportation with a lead of 1.00 km and complete as per specifications. MORTH Specification No.301	Cum							
	(Pg, 143, Item 19.14).								
	For Compound (Puttenahalli side)		2	205.00	0.75	0.85	261.38		
						Say	**261.50**	44.3	11,579.22
	Basic Rate	41.00							
	Area Weightage	3.28							
	Total	44.28							
3.10	KSRB 4-1.3 : Providing and laying in position plain cement concrete of Mix 1:4:8 with OPC @ 180kgs, with 40mm and down size graded granite metal coarse aggregates @0.85cum and fine aggregates @ 0.57cum machine mixed, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation, including cost of all materials, labour, HOM curing complete as per specifications. Specification No. KBS 4.1, 4.2	Cum							
	(PWD SR 18-19, Pg No: 13, It No: 4.3,)								
	For Compound bed		2	205.00	0.75	0.15	46.13		
						Say	**46.50**	5583.0	2,59,611.41
	concrete **Basic** Cost	5,102.00		old					
	Cement content	180.00	kg						
	Cement Rate/Quintal	490.63							
	cost of cement/kg	4.91	Rs						
		883.13							
	Cost Excluding Cement	4,218.87							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	180.00	kg						
	Cost of Cement	950.62							
	Basic new cost of concrete	**5,169.48**	**Cum**	NEW					
	Basic Rate	5,169.48							
	Area Weightage	413.56							
	Total	5,583.04							
3.11	KSRB 5.2-3: Providing and constructing **granite / trap / basalt size stone masonry in foundation with cement mortor 1:6,** stone hammered dressed in courses not less than 20cms high, bond stones at 2m. apart in each course including cost of materaials, labour, curing complete asper specifications. Specifcation No. KBS 5.1.13.	Cum							
	(P.No.25, I.No.5.6 of PW, P&IWTD S.R 2018-19)								
	For compound								
	1st Footing		2	205.00	0.60	0.450	110.70		
	2nd footing		2	205.00	0.45	0.45	83.03		
							193.73		
						Say	**194.00**	4963.7	9,62,953.92
	Basic Rate	4,596.00							
	Area Weightage	367.68							
	Total	4,963.68							

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
3.12	KSRB 4-1.6 ; Providing and laying in position plain cement concrete of Mix 1:2:4 with OPC @ 240kgs, with 20mm and down size graded granite metal coarse aggregates @ 0.878 cum and fine aggregtes @ 0.53cum, machine mixed, concrete laid in layers not exceeding 15 cms. thick, well compacted, in foundation, plinth and cills, including cost of all materials, labour, HOM curing complete as per specifications. Specification No. KBS 4.1, 4.2	Cum							
	(P.No.13, I.No 4.6 of PW, P&IWTD S.R 2018-19)								
	For Plinth at Basement Lvl		2	205.00	0.45	0.10	18.45		
	At Top Coping		2	205.00	0.20	0.10	8.20		
							26.65		
						Say	**27.00**	5952.9	1,60,729.22
	concrete **Basic** Cost	5,422.00		**old**					
	Cement content	240.00	kg						
	Cement Rate / Quintal	490.63							
	cost of cement/kg	4.91	Rs						
		1,177.51							
	Cost Excluding Cement	4,244.49							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	240.00	kg						
	Cost of Cement	1,267.49							
	Basic new cost of concrete	**5,511.98**	**Cum**	NEW					
	Basic Rate	5,511.98							
	Area Weightage	440.96							
	Total	5,952.93							
3.13	KSRB 5-14.1 : Providing and constructing load bearing wall with solid concrete blocks having block density not less than 1800kg/m3 having a minimum average compressive strength of 5.00 N/mm2 confirming to IS 2185 (Part 1):2005 and constructed with CM 1:4, as per IS 2572:2005 including cost of all materials labour charges, scaffolding, curing, hire charges of machineries etc., complete as per specifications. KBS No.5.4 with solid concrete blocks of size 400x200x200mm	Sqm							
	(P.No.27, I.No 5.27.1 of PW, P&IWTD S.R 2018-19)								
	For compound		2	205.00	--	2.00	820.00		
						Say	**820.00**	984.96	8,07,667.20
	concrete **Basic** Cost	912.00		**old**					
	Cement content	8.99	kg						
	Cement Rate / Quintal	490.63							
	cost of cement/kg	4.91	Rs						
		44.08							
	Cost Excluding Cement	867.92							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	8.99	kg						
	Cost of Cement	47.45							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	Basic new cost of concrete	**915.37**	**Cum**	NEW					
	Basic Rate	912.00							
	Area Weightage	72.96							
	Total	984.96							
3.14	KSRB 15.1 Providing flush pointing 20 mm deep to square rubble, course or uncoursed stone masonry with cement mortar after raking joints to depth of 20mm nicely lining, including cost of materials, labour, curing complete as per specifications. cement mortar 1:4	Sqm							
	(P.No.115, I.No.15.2 of PW, P&IWTD S.R 2018-19)								
	For Basement		4	205.00	0.45	--	369.00		
						Say	**369.00**	151.2	55,792.80
	Basic Rate	140.00							
	Area Weightage	11.20							
	Total	151.20							
3.15	KSRB - 15-3.7: Providing 18mm thick **cement plaster** in single coat with **cement mortor 1:6**, to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications.	Sqm							
	(P.No.116, I.No.15.17 of PW,P&IWTD S.R 2018-19)								
	For Compound		4	205.00	--	2.05	1681.00		
						Say	**1681.00**	267.63	4,49,889.81
	concrete **Basic** Cost	245.00		old					
	Cement content	7.49	kg						
	Cement Rate / Quintal	490.63							
	cost of cement/kg	4.91	Rs						
		36.74							
	Cost Excluding Cement	208.26							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	7.49	kg						
	Cost of Cement	39.55							
	Basic new cost of concrete	**247.81**	**Cum**	NEW					
	Basic Rate	247.81							
	Area Weightage	19.83							
	Total	267.63							
3.16	KSRB 2.3: Filling **available Excavated Earth (excluding rock)** in sides of foundations upto plinth in layers not exceeding 20cms in depth, compacting each deposited layer by raming after watering with lead upto 50m and lift upto 1.50m including cost of all labour complete as per specifcations. Specification No. KBS 2.9	Cum.							
	(P.No.7, I.No.2.10 of PW, P&IWTD S.R 2018-19)								
	For foundation								
	Same as Qty of Item No.3.13 - I.No.3.14 & 3.15 ,(3.15/2)		--	--	--	--	7.50		
						Say	**7.50**	217.1	1,628.10
	Basic Rate	201.00							
	Area Weightage	16.08							
	Total	217.08							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
3.17	KSRB 15-16.1: Providing and finishing **external walls in two coats with waterproof cement paint** of approved brand and shade to give and even shade after throughly brooming the surface to remove all dirt and loose powdered material, free from mortar drops and other foreign matter cost of materials, labour, complete as per specifications. **(with primer)**	Sqm							
	(P.No.120, I.No.15.53.2 of PW, P & IWTD S.R 2011-12)								
	For Compound allround		2	205.00	--	4.25	1742.50		
						Say	**1742.50**	110.2	1,91,953.80
	Basic Rate	102.00							
	Area Weightage	8.16							
	Total	110.16							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
3.18	KSRRB M100-4.1: Cost of Haulage including loading and unloading of stone Boulder / Stone aggregates / Sand /Kankar / Moorum KSRRB M100-1: Placing tipper at loading point, loading with front end loader, dumping, turning for return trip, excluding time for haulage and return trip complete as per specifications. MoRT&H Chapter 1	Cum							
	Conveying up to 16km by Mechanical means.								
	(Page No.135 of PW, P & IWTD S.R 2011 - 12)		–	–	–	–	254.00	38.7	9,831.58
	Qnty same as item no 3.08-3.15								
	For 16Km Rs. 2.0 X 1.28 X 14 =35.84								
	Basic Rate	35.84							
	Area Weightage	2.87							
	Total	38.71							
								TOTAL	1,31,92,166.00

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BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
4.00	**Median, Kerb & Pier protection below flyover**								
	Pier Protection / Median kerb								
4.01	Providing Pre Cast RCC High size medians of 2.0m length, 0.1m top width, 0.5m bottom width and 1.0m hight of M30 grade including loading at casting yard, Transportation to site, Lowering Hoisting and Erecting to line including all labour charges, Taxes etc., complete as per the directions of Engineer -in-charge.	Rm							
	Towards Puttenahalli		1	990			990.00		
	Towards Kadrenahalli		1	990			990.00		
							1980.00		
	Say Rs.9705.0 per Each Block of Length 2.0m	Rm					990.00	9705	96,07,950.00
	(DATA Rate)								
4.02	Providing and fixing Pre cast solid cement concrete kerb stones made out of C.C 1:2:4 with top and bottom width 114 and 165 mm respectively, 400mm high and 450mm in length finished with CM1:3 platering and finishing cutting, including form work, curing , including cost of all materials, labours, hire charges of machinery, loading , unloading lead and lift , transportation etc., complete	No's							
	(P.No.27, 5.30 of PW, P&IWTD SR 2018-19)								
	B/S Drain edge		2	1567.00		0.45	6964.00		
	At solid ramp both ends		2	276.00		0.45	1227.00		
							8191.00		
						Say	8191.00	440.64	36,09,282.24
	Basic Rate	408.00							
	Area Weightage	32.64							
	Total	440.64							
								TOTAL	1,32,17,232.24

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BSK 1st Stage

BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
5.00	**ROAD FURNITURE & OTHER WORK**								
5.01	KSRS M800 - 13. **Road Marking** with Hot Applied Thermoplastic Compound with Reflectrising Glass Beads on Bituminous Surface: - Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads at 250 gms per sqm area, thickness of 2.5mm is exclusive of surface applied glass beads as per IRC:35. The finished surface to be level, uniform and free from streaks and holes complete as per specifications. MORTH Specification No. 803.	Sqm							
	(P.No.182, I.No.24.15 of PW,P&IWTD 2018-19)								
	On Flyover								
(a)	Lane Marking line		4	1626.00	0.15	--	975.60		
(c)	Directional arrows		4	5.00	0.90	--	18.00		
	On Surface								
(a)	Lane Marking line		1	1626.00	0.15	--	243.90		
			1	1626.00	0.15	--	243.90		
(b)	Edge line								
			1	1626.00	0.15	--	243.90		
			1	1626.00	0.15	--	243.90		
(c)	Pedestrain crossings								
			16	5.50	0.15	--	13.20		
(d)	Directional arrows		16	5.00	0.90	--	72.00		
							2054.40		
						Say	**2054.50**	463.32	**9,51,890.94**
	Basic Rate	429							
	Area Weightage	34.32							
	Total	463.32							
5.02	KSRRB 800-1. **Painting two coats** after filling the surface with synthetic enamel paint in approved shades on new plastered concrete surfaces, with materials, labour complete as per specifications. MORTH Chapter 8	Sqm							
	(P.No.180, I.No. 24.1 of PW,P&IWTD SR 2018-19)								
	Towards Kadrenahalli		2	216.62		3.00	1299.72		
	Towards Puttenahalli		2	69.74		3.00	418.44		
	Abutment side		2	18.00		5.50	198.00		
							1916.16		
						Say	**1916.50**	86.40	**1,65,585.60**
	Basic Rate	80.00							
	Area Weightage	6.40							
	Total	86.40							

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs.	Amount in Rs.
				m	m	m		SR 18-19	
5.03	KSRRB M800-15. **Road Delinators:** Supplying and Installation of delineators (road way indicators, hazard markers, object markers), 80 - 100 cm high above ground level, painted black and white in 15 cm wide strips, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC - 79 and the drawings complete as per specifications. MORTH Specification No. 805.	Each							
	(P.No.182, I.No.24.19 of PW,P&IWTD SR 2018-19)								
	For Every 50m interval								
	On Surface Road		55	--	--	--	55		
							55	2000.16	**1,09,368.75**
	Basic Rate	1,852.00							
	Area Weightage	148.16							
	Total	2,000.16							
5.04	**Retro Reflectorised Traffic Signs**								
	KSRRB M800-2. **Retro-Reflectorised Traffic Signs:** Providing and fixing of Retro-reflectorised cautionary, mandatory, informatory sign as per IRC:67 made of high intensity grade sheeting vide clause 800.1.3, fixed over Aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75mm x 75mm x 6mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45cm x 45cm x 60cm, 60cm below ground level as per approved drawing complete as per specifications. MORTH Specification No. 801.								
	(P.No.180, I.No.24.2.3 of PW,P&IWTD SR 2018-19)								
(i)	60cm circular								
a)	No parking board	Each	10	--	--	--	10.00		
b)	Speed limit board	Each	20	--	--	--	20.00		
c)	Compulsary ahead or left turn	Each	4	--	--	--	4.00		
d)	Overtaking prohibited board	Each	4	--	--	--	4.00		
e)	No stopping sign board	Each	10	--	--	--	10.00		
							48.00	3371.76	**1,61,844.48**
	Basic Rate	3,122.00							
	Area Weightage	249.76							
	Total	3,371.76							
(ii)	90cm equilateral triangle								
a)	Pedestrian crossing sign boards	Each	16	--	--	--	16.00		
b)	No Pedestrian crossing sign boards	Each	6	--	--	--	6.00		
							22.00	3730.32	**82,067.04**
	Basic Rate	3,454.00							
	Area Weightage	276.32							
	Total	3,730.32							
(iii)	Informatory sign boards								
(a)	90cm high octagon	Each	10	--	--	--	**10.00**	5450.76	**54,507.60**

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	Basic Rate	3,454.00							
	Area Weightage	276.32							
	Total	3,730.32							
(iii)	Informatory sign boards								
(a)	90cm high octagon	Each	10	--	--	--			
							10.00	5450.76	54,507.60
	Basic Rate	5047							
	Area Weightage	403.76							
	Total	5450.76							
5.05	KSRRB M800-20. **Tubular Steel Railing** on Medium Weight Steel Channel (ISMC Series) 100 mm x 50mm: - Providing, fixing and erecting 50 mm dia steel pipe railing in 3 rows duly painted on medium weight steel channels (ISMC series) 100 mm x 50mm, 1.2 metres high above ground, 2 m centre to centre, complete as per approved drawings as per specifications. MORTH Specification No. 808.	Rmt							
	(P.No.184, I.No.24.24 of PW,P&IWTD SR 2018-19)								
			2	1626.00	--	--	3252.00		
	Basic Rate	1,426.00					3252.00	1540.08	50,08,340.16
	Area Weightage	114.08							
	Total	1,540.08							
5.06	**KSRRB M800-35** Providing and fixing of road stud 100 x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphlatic surface by drilling hole 30 mm upto a depth of 60mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS: 873 part 4: 1973 complete as per specifications.	Nos.							
	(P.No.187, I.No.24.41 of PW,P&IWTD SR 2018-19)								
	Spaced at Five meter interval								
	For Every 5m Interval								
	L=1363 X 4 = 5452m								
	No's = 5452/5 = 1091		1091	--	--	--	1091		
	on Surface								
	L=1290X 2 = 2580m								
	No's = 2580/5 =516		516	--	--	--	516		
	Basic Rate	337					1607	363.96	5,84,883.72
	Area Weightage	26.96							
	Total	363.96							
								TOTAL	71,18,488.29

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BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
6.00	**FLYOVER WORKS**								
6.01	KSRRB M2100-2.1 Earth work excavation in all kinds of soils for foundation of structures as per drawing and technical specifications,including setting out, providing shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and filling back with approved material including cost of all materials, labour, HOMcomplete as per specifications. MORTH Specification No. 304	Cum							
	(P.No.220, I.No.27.4 of PW, P&IWTD S.R. 2018 - 19)								
	Pile Foundation								
	AP1 & AP2		2.00	5.30	5.30	2.40	134.83		
	Standard pier (30mt)		28.00	8.90	5.30	2.40	3,169.82		
	Obligatory pier (40mt)		2.00	8.90	8.90	2.40	380.21		
	Standard Span Piers (25mt)		6.00	5.30	5.30	2.10	353.93		
						Say	**4,038.79**	54.00	**2,18,094.66**
	Basic Rate	50.00							
	Area Weightage 8%	4.00							
	Total	54.00							
6.02	KSRRB M2100-13. Providing and laying Plain / Reinforced Cement Concrete of mix 1:2:4 with OPC @ 240kgs, with 40mm and down size graded granite metal coarse aggregates @0.84cum and fine aggregates @ 0.56cum in Open Foundation including cost of all materials, labour,HOM curing, form works, scaffolding and centering complete as per specifications complete as per Drawing and Technical Specifications. MORTH Specification No. 1500,1700 & 2100	Cum							
	(P.No.222, I.No.27.24 of PW, P&IWTD S.R. 2018 - 19)								
	AP1 & AP2		2.00	5.30	5.30	0.10	5.62		
	Standard pier (30mt)		28.00	8.90	5.30	0.10	132.08		
	Obligatory pier (40mt)		2.00	8.90	8.90	0.10	15.84		
	Standard Span Piers (25mt)		6.00	5.30	5.30	0.10	16.85		
						Say	**170.39**	5,608.41	**9,55,617.66**
	concrete **Basic** Cost	5,103.00		**old**					
	Cement content	240.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,177.51							
	Cost Excluding Cement	3,925.49							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	240.00	kg						
	Cost of Cement	1,267.49							
	Basic new cost of concrete	**5,192.98**	**Cum**	NEW					
	Basic Rate	5,192.98							
	Area Weightage	415.44							
	Total	5,608.41							

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs.	Amount in Rs.
				m	m	m		SR 18-19	
6.03	KSRRB M1100-3.1. Bored cast-in-situ R.C.C. Pile with OPC design mix M35 @ 390kgs, with 20mm and down size graded granite metal coarse aggregates @0.68cum and fine aggregtes @ 0.45cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008, excluding Reinforcement complete as per Drawing and Technical Specifications and removal of excavated earth with all lifts and lead upto 1000 m including costs of all materials, labour, HOM form works, scaffolding & centering complete as per specifications.MORTH Specification No.1100 & 1700 B. KSRRB M1100-3.2. -do- C. Pile diametre = 1200 mm	Rm							
	(P.No.197, I.No.25.5 of PW, P&IWTD S.R. 2018 - 19)								
	Pile								
	AP1 & AP2 - 6 piles		12.00	19.00			228.00		
	standard Span Piers - 30m 6 piles		168.00	19.00			3,192.00		
	Obligatory pier (40mt) - 8 piles		16.00	19.00			304.00		
	Standard Span Piers -25m - 4 piles		24.00	19.00			456.00		
	Testing of pile		2.00	19.00			38.00		
		Total	**222.00**						
						Say	**4,218.00**	9,121.91	3,84,76,207.94
	concrete **Basic** Cost	8,300.00		**old**					
	Cement content	390.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,913.46							
	Cost Excluding Cement	6,386.54							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	390.00	kg						
	Cost of Cement	2,059.67							
	Basic new cost of concrete	**8,446.21**	**Cum**	NEW					
	Basic Rate	8,446.21							
	Area Weightage	675.70							
	Total	9,121.91							
6.04	(A) Doing Initial vertical load test for a design pile load of 270 Tons including cost of all equipment, men material, reaction piles etc (if required for the setup complete as per drawing and technical specification and as directed by the engineer in charge	Nos							
	(P.No.151, I.No.12.37(a) of NHSR 2018-19)								
	Pile		5.00				5.00		
						Say	5.00	81,000.00	**4,05,000.00**
	Basic Rate/ Tons	300.00							
	Pile load in Tons	270.00							
	Total	81,000.00							
	(B) Doing horizontal load test for a design pile load of 20 Tons including cost of all equipment, men and material, reaction piles etc (if required) required for the setup complete as per drawing and technical specifcation as directed by the engineer in charge	Nos							
	(P.No.151, I.No.12.37(b) of NHSR 2018-19)								
	Pile		5.00				5.00		
						Say	5.00	1,05,000.00	**5,25,000.00**
	Basic Rate / Tons	5,000.00							
	Pile load in Tons	20.00							
	Total	1,05,000.00							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
6.05	KSRRB M1200-47. Providing steel liner 10 mm thick for curbs and 6 mm thick for seining of wells including fabricating and setting out as per detailed drawing complete as per specifications including cost of all materials, labour, HOM, form works, scaffolding & centering complete as per specifications. MORTH Specification No.1200 & 1900	MT							
	(P.No.217, I.No.26.125 of PW, P&IWTD S.R. 2018 - 19)								
	Pile (0.006*7.850*(3.142*1.2)) =0.148								
	AP1 & AP2 - 6 piles		12.00	8.00	0.178		17.09		
	standard Span Piers - 30m 6 piles		168.00	8.00	0.178		239.23		
	Obligatory pier (40mt) - 8 piles		16.00	8.00	0.178		22.78		
	Standard Span Piers -25m - 4 piles		24.00	8.00	0.178		34.18		
	Testing of pile		2.00	8.00	0.178		2.85		
						Say	**316.13**	74,076.12	**2,34,17,683.82**
	Basic Rate	68,589.00							
	Area Weightage 8%	5,487.12							
	Total	74,076.12							
6.06	KSRRB M1100-11.2. -do- RCC with OPC design mix M35 @ 390kgs, with 20mm and down size graded granite metal coarse aggregates @0.68cum and fine aggregtes @ 0.45cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008. Case-II: Using Batching Plant, Transit Mixer and Concrete Pump. including costs of all materials, labour, HOM, form works, scaffolding & centering. MORTH Specification No.1100, 1500 & 1700 **Pile Cap**	Cum							
	(P.No.200, I.No.25.25 of PW, P&IWTD S.R. 2018 - 19)								
	Pile foundation								
	Pile cap								
	AP1 & AP2		2.00	5.10	5.10	1.80	93.64		
	Standard pier (30mt)		28.00	8.70	5.10	1.80	2,236.25		
	Obligatory pier (40mt)		2.00	8.70	8.70	1.80	272.48		
	Standard Span Piers (25mt)		6.00	5.10	5.10	1.50	234.09		
						Say	**2,836.46**	5,807.39	**1,64,72,423.77**
	concrete **Basic** Cost	5,231.00		**old**					
	Cement content	390.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,913.46							
	Cost Excluding Cement	3,317.54							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	390.00	kg						
	Cost of Cement	2,059.67							
	Basic new cost of concrete	**5,377.21**	**Cum**	NEW					
	Basic Rate	5,377.21							
	Area Weightage	430.18							
	Total	5,807.39							
6.07	KSRRB M2200-5.19. Providing and laying Design mix M35 with OPC @ 390kgs, with 20mm and down size graded granite metal coarse aggregates @0.68cum and fine aggregates @ 0.45cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. - ii) For height 5m to 10m **(Pier)**								
	(P.No.228, I.No.28.7.19 of PW, P&IWTD S.R. 2018 - 19)								
	AP1 & AP2		2.00	2.00	2.20	0.07	0.62		

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
	Standard pier (30mt)		28.00	2.00	2.20	4.52	556.86		
	Obligatory pier (40mt)		2.00	2.00	2.20	3.71	32.61		
	Standard Span Piers (25mt)		6.00	2.00	2.20	3.45	91.08		
						Say	**681.17**	6,945.71	**47,31,207.92**
	concrete **Basic** Cost	6,285.00		**old**					
	Cement content	390.00	**kg**						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,913.46							
	Cost Excluding Cement	4,371.54							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	390.00	kg						
	Cost of Cement	2,059.67							
	Basic new cost of concrete	**6,431.21**	**Cum**	NEW					
	Basic Rate	6,431.21							
	Area Weightage	514.50							
	Total	6,945.71							
6.08	KSRRB M2200-5.19. Providing and laying Design mix M35 with OPC @ 390kgs, with 20mm and down size graded granite metal coarse aggregates @0.68cum and fine aggregates @ 0.45cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. **- ii) For height 5m to 10m (Pier Cap)**								
	(P.No.228, I.No.28.7.19 of PW, P&IWTD S.R. 2018 - 19)								
	Pier cap								
	Standard Span Piers (25mt)								
			6.00	6.00	2.80	1.20	120.96		
			6.00	3.18	area	2.80	53.42		
	AP1 & AP2		2.00	6.00	2.80	1.20	40.32		
			2.00	3.18	area	2.80	17.81		
	Dirt walls		2.00	17.00	1.14	0.40	15.50		
			2.00	12.20	1.36	0.40	13.27		
	Pier cap haunch		2.00	7.20	1.25	0.63	11.25		
	Dirtwall haunch		2.00	16.00	0.30	0.30	2.88		
			1.00	16.00	0.30	0.15	0.72		
	Obligatory pier (30mt)		28.00	6.00	2.80	1.20	564.48		
			28.00	3.18	area	2.80	249.31		
	Obligatory pier (40mt)		2.00	6.00	2.80	1.20	40.32		
			2.00	3.18	area	2.80	17.81		
						Say	**1,148.06**	6,945.71	**79,74,075.64**
	concrete **Basic** Cost	6,285.00		**old**					
	Cement content	390.00	**kg**						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,913.46							
	Cost Excluding Cement	4,371.54							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	390.00	kg						
	Cost of Cement	2,059.67							
	Basic new cost of concrete	**6,431.21**	**Cum**	NEW					
	Basic Rate	6,431.21							
	Area Weightage	514.50							
	Total	6,945.71							

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
6.09	KSRRB M2200-5.18. Providing and laying Design mix M35 with OPC @ 390kgs, with 20mm and down size graded granite metal coarse aggregates @0.68cum and fine aggregates @ 0.45cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. - i) U pto 5m height								
	(P.No.228, I.No.28.7.18 of PW, P&IWTD S.R. 2018 - 19)								
	Pedestal								
	AP1 & AP2		4.00	0.90	0.90	0.30	0.97		
	Standard pier (30mt)		112.00	0.90	0.90	0.30	27.22		
	Obligatory pier (40mt)		8.00	0.90	0.90	0.30	1.94		
	Standard Span Piers (25mt)		24.00	0.90	0.90	0.30	5.83		
						Say	**35.96**	6,164.87	**2,21,688.65**
	concrete **Basic** Cost	5,562.00		**old**					
	Cement content	390.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,913.46							
	Cost Excluding Cement	3,648.54							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	390.00	kg						
	Cost of Cement	2,059.67							
	Basic new cost of concrete	**5,708.21**	**Cum**	NEW					
	Basic Rate	5,708.21							
	Area Weightage	456.66							
	Total	6,164.87							
6.10	KSRRB M2300-14. Providing T.M.T. steel reinforcement for R.C.C. work including straightening, cutting, bending, hooking, placing in position, lapping and/or welding wherever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) including cost of materials, labour, HOM complete as per specifications. MORTH Specification No. 1600 & 2200 do- TMT Bars Fe 500	MT							
	(P.No.229, I.No.28.8.2 of PW, P&IWTD S.R 2018-19)								
	Considering 110kg/Rm for Pile		4,218.00	Rm	110.00	Kg/rm	463.98		
	Considering 120kg/Cum for Pile Cap		2,836.46	cum	120.00	Kg/cum	340.38		
	Considering 220kg/cum for Piers		681.17	Cum	220.00	Kg/cum	149.86		
	Considering 240kg/cum for Pier Cap		1,148.06	Cum	240.00	Kg/cum	275.53		
	Considering 140kg/cum for Pedestal		35.96	Cum	140.00	Kg/cum	5.03		
							1,234.78		
						Say	**1,240.00**	66,274.20	**8,21,80,008.00**
	Issued rate dated 02.07.2020	61,365.00							
	Area Weightage	4,909.20							
	Total	66,274.20							
6.11	KSRRB M2200-12. Supplying, fitting and fixing in position true to line and level sliding plate bearing with PTFE surface sliding on stainless steel complete including all accessories as per drawing and Technical Specifications and BS: 5400, section 9.1 & 9.2 (for PTFE) and clause 2000.4 of MORTH Specifications including cost of materials, labour, HOM complete as per specifications. MORTH Specification No.2000 & 2200								

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	(P.No.230, I.No.28.16 of PW,P&IWTD S.R 2018-19)								
	a) Guided/ free PTFE bearings 500MT vertical Capacity	Nos.	--	--	--	--	**8.00**	6,06,420.00	**48,51,360.00**
	Basic Rate (1123 x 500)	5,61,500.00							
	Area Weightage	44,920.00							
	Total	6,06,420.00							
	b) Guided/ free PTFE bearings 380MT vertical Capacity	Nos.	--	--	--	--	**140.00**	4,60,879.20	**6,45,23,088.00**
	Basic Rate (1123 x 380)	4,26,740.00							
	Area Weightage	34,139.20							
	Total	4,60,879.20							
6.12	KSRRB M2300-12. Providing and Placing Reinforced / Prestressed cement concrete in super-structure as per drawing and Technical Specification complete as per specifications. PSC with OPC design mix M50 @ 450kgs, with 20mm and down size graded granite metal coarse aggregates @0.66cum and fine aggregates @ 0.44 cum, with superplastisiser @4lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM, curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 1500,1600 & 1700 **Cast insitu Box - Girder , Segmental Construction**								
	(P.No.237, I.No.29.27.2 of PW,P&IWTD S.R 2018-19)								
	30M Segmental Girder								
	Running Section		7.00	3.05	9.57	area	204.38		
	Tapper Section		2.00	2.50	10.24	area	51.20		
	End Section		2.00	1.80	19.05	area	68.58		
							324.16	Per Span	
	25m Segmental Girder								
	Running Section		5.00	3.27	9.57	area	156.52		
	Tapper Section		2.00	2.50	10.24	area	51.20		
	End Section		2.00	1.80	19.05	area	68.58		
							276.30	per Span	
	40mt Cast in situ Box Girder								
	Middle		1.00	22.40	10.00	area	224.00		
	End Section		2.00	5.00	11.00	area	110.00		
	Tapper Portion		2.00	2.50	10.50	area	52.50		
	Enddiaghpram		2.00	1.28	21.08	area	53.75		
							440.25	per Span	
	30M Segmental Girder		28.00	324.16	volume per span		**9,076.48**		
	25m Segmental Girder		8.00	276.30	volume per span		**2,210.40**		
	40mt Cast in situ Box Girder		1.00	440.25	volume per span		**440.25**		
						Say	**11,727.13**	8,448.26	**9,90,73,784.66**
	concrete **Basic** Cost	7,665.00		**old**					
	Cement content	420.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		2,060.65							
	Cost Excluding Cement	5,604.35							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	420.00	kg						
	Cost of Cement	2,218.10							
	Basic new cost of concrete	**7,822.46**	**Cum**	NEW					
	Basic Rate	7,822.46							
	Area Weightage	625.80							

Sl. No.	Description of Work	Unit	No.	Length	Breadth	Depth	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
				m	m	m			
	Total	8,448.26							
6.13	KSRRB M2300-1.1. Providing and Placing Reinforced / Prestressed cement concrete in super-structure as per drawing and Technical Specification complete as per specifications. A. RCC - with OPC design mix M20 @ 320kgs, with 20mm and down size graded granite metal coarse aggregates @0.69cum and fine aggregates @ 0.46cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008. including cost of materials, labour, HOM, curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 1500,1600 & 1700, 1800, 2300 & IS 456 for Central Median	Cum							
	(P.No.232, I.No.29.1 of PW, P&IWTD S.R. 2018 - 19)								
	Median		1.00	1,080.00	1.00	0.30	324.00		
						Say	**324.00**	7,120.41	**23,07,011.22**
	concrete **Basic** Cost	6,473.00		**old**					
	Cement content	320.00	kg						
	Cement Rate / Quintal	490.63							
	cost of cement/kg	4.91	Rs						
		1,570.02							
	Cost Excluding Cement	4,902.98							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	320.00	kg						
	Cost of Cement	1,689.98							
	Basic new cost of concrete	**6,592.97**	**Cum**	NEW					
	Basic Rate	**6,592.97**							
	Area Weightage 8%	527.44							
	Total	**7,120.41**							
6.14	KSRRB M2300-9.2. Providing and Placing Reinforced / Prestressed cement concrete in super-structure as per drawing and Technical Specification complete as per specifications. PSC with OPC design mix M40 @ 420kgs, with 20mm and down size graded granite metal coarse aggregates @0.67cum and fine aggregates @ 0.44cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008, including cost of materials, labour, HOM, curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 1500,1600 & 1700 **FOR CRASH BARRIER**	Cum							
	(P.No.236, I.No.29.20.1 of PW, P&IWTD S.R. 2018 - 19)								
			2.00	1,080.00	0.325	area	702.00		
						Say	702.00	7,807.82	**54,81,086.13**
	concrete **Basic** Cost	7,072.00		**old**					
	Cement content	420.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		2,060.65							
	Cost Excluding Cement	5,011.35							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	420.00	kg						
	Cost of Cement	2,218.10							
	Basic new cost of concrete	**7,229.46**	**Cum**	NEW					
	Basic Rate	7,229.46							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	Area Weightage	578.36							
	Total	7,807.82							
6.15	KSRRB M2300-14. Providing T.M.T. steel reinforcement for R.C.C. work including straightening, cutting, bending, hooking, placing in position, lapping and/or welding wherever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) including cost of materials, labour, HOM complete as per specifications. MORTH Specification No. 1600 & 2200 do- TMT Bars Fe 500	MT							
	(P.No.239, I.No.29.29.2 of PW, P&IWTD S.R 2018-19)								
	Considering 210kg/cum for Segmental Girder		11,286.88	Cum	210.00	Kg/cum	2,370.24		
	Considering 250kg/cum for Cast in situ		440.25	Cum	250.00	Kg/cum	110.06		
	Considering 150kg/cum for Crash Barrier		702.00	Cum	150.00	Kg/cum	105.30		
	Considering 60kg/cum for Median		324.00	Cum	60.00	Kg/cum	19.44		
							2,605.05		
						Say	**2,605.50**	67,970.88	**17,70,98,127.84**
	Issue rate dated 02.07.2020	62,936.00							
	Area Weightage	5,034.88							
	Total	67,970.88							
6.16	KSRRB M2300-15. High tensile steel wires / strands including all accessories for stressing, stressing operations and grouting complete as per drawing and Technical Specifications complete as per specifications MORTH Specification No. 1800	Rmt							
	(P.No. 239, I.No.29.30 of PW,P&IWTD S.R 2018-19)								
	60kg per Cum for Box Girder (40mt Span)		11,727.13	Cum	60.00	KG/ Cum	703.63		
	55kg per Cum for Segmental Girder (30m span)		440.25	Cum	55.00	KG/ Cum	24.21		
							727.84	1,83,880.80	**13,38,36,086.49**
	Basic Rate	1,70,260.00							
	Area Weightage	13,620.80							
	Total	1,83,880.80							
6.17	KSRRB M2600-9. Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/ supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation including cost of materials, labour, HOM complete as per specifications. MORTH Specification No. 2607	Rmt							
	(P.No. 245, I.No.31.9 of PW,P&IWTD S.R 2018-19)		38.00	17.00	--	--	**646.00**	15,054.12	**97,24,961.52**
	Basic Rate	13,939.00							
	Area Weightage	1,115.12							
	Total	15,054.12							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
6.18	**Anti carbonate painting** High performance Anti carbonation protective coating Providing and applying primer and two coats of 100% acrylic breathable, water based, anti-carbonation coating. Coating to be applied at the rate 300 g/m2. Minimum DFT of coating to be 225 micron. The coating shall have atleast a 4 year track record of use as an anti-carbonation coating and shall have the test reports evaluated from Ministry of New and renewable Resources supported laboratory demonstrating Solar Reflectance Index (ASTM E 1980-11, EN 673:2011, EN 410:2011) > 104. 1. Carbon dioxide diffusion equivalent air layer thickness (DIN EN 1062-6) > 100 m 2. Carbon dioxide diffusion resistance co-efficient (DIN EN 1062-6) > 7.50 X 105 3. Elongation of cured film shall be as per ASTM D 2370/98 > 400% 4. Chloride Ion Diffusion(ASTM C 1202) = Zero Penetration 5. Adhesion (ASTM D 4541) > 2 N/mm2	Sqm							
	(PWD SR 18-19, Pg, 320. Item No.38.71)								
	Crash Barrier		2.00	1,080.00	--	2.30	4,968.00		
	For Suprestructure		1.00	1,080.00	18.72	area	20,217.60		
	for Substructure (Pier cap)		37.00	26.40			976.80		
	for Substructure (Pier)		37.00	44.00			1,628.00		
							27,790.40		
						Say	**27,790.50**	244.08	**67,83,105.24**
	Basic Rate	226.00							
	Area Weightage	18.08							
	Total	244.08							
6.19	KSRRB M2700-5. Drainage Spouts using 100mm class 'B' GI pipe as per drawing and Technical specification including clamps and nuts etc., including cost of materials, labour, HOM complete as per specifications. MORTH Specification No. 2705	No.							
	(P.No.247, I.No.32.5 of PW,P&IWTD S.R 2018-19)								
	At 3m interval on both sides		2.00	360.00	--	--	**720.00**		
							720.00	1,676.16	**12,06,835.20**
	Basic Rate	1,552.00							
	Area Weightage 8	124.16							
	Total	1,676.16							
6.20	Providing and fixing to wall, ceiling and floor unplasticised PVC 6.00 kgs/sqcm working pressure with pipe fittings, wall clips etc., and making good the wall, ceiling and floor for sanitary pipelines including cost of all materials, labour charges, HOM and testing complete as per specifications. do - 200 mm dia	m							
	(P.No.90, I.No.12.116.4 of PW,P&IWTD S.R 2018-19)								
	PVC Pipe for rain water disposal (Horizontal)		2.00	1,080.00	--	--	2,160.00		
	PVC Pipe for rain water disposal (Vertical downtake)		2.00	117.00	--	--	234.00		
							2,394.00	1,462.32	**35,00,794.08**
	Basic Rate	1,354.00							
	Area Weightage	108.32							
	Total	1,462.32							
6.21	KSRB 2.3 : **Filling available excavated earth (excluding rock)** in sides of foundations upto plinth in layers not exceeding 20 cms. in depth, compacting each deposited layer by ramming after watering with lead upto 50 m. and lift upto 1.5 m. including cost of all labour complete as per specifications. Specification No. KBS 2.9	Cum.							
	(Pg.No. 7, I.No. 2.10 of PW, P & IWTD S.R 2018-19)								
	For foundation								

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	Same as Qty of Item No.6.01-6.02-6.06		--	--	--	--	1,031.94		
						Say	**1,032.00**	217.08	**2,24,026.56**
	Basic Rate	201.00							
	Area Weightage	16.08							
	Total	217.08							
6.22	Providing and laying 3mm thick asphalt seal pad made of actatic polypropylene polymer (app) modified bituminous pad reinforced with non woven polyester mat of high bear strength as a carrier (confirming to ASTM - D6222 (S) Specification) on concrete bridge deck slab including cost of materials, labour, HOM complete as per specifications.	Sqm							
	(P.No.248 I.No.32.13 of PW,P&IWTD SR of 2018-19)								
			2.00	1,080.00	7.50	--	16,200.00		
						Say	**16,200.00**	438.48	**71,03,376.00**

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
						Say	16,200.00	438.48	71,03,376.00
	Basic Rate	406.00							
	Area Weightage	32.48							
	Total	438.48							
6.23	KSRRB 500-7. Providing and applying tack coat using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications. Clause 503 of MORTH V revision	Sqm							
	(P.No.158 I.No.21.7 of PW,P&IWTD SR of 2018-19)								
	Main Arm		2.00	1,080.00	7.50	--	16,200.00		
							16,200.00		
						Say	16,200.00	12.96	2,09,952.00
	Issue rate dated 02.07.2020	12.00							
	Area Weightage	0.96							
	Total	12.96							
6.24	Stone Matrix Asphalt (SMA) as per section 515 of MORTH 5th Revision: Providing and laying Stone Matrix Asphalt (SMA) using crushed aggregates of specified grading (as per section 515 of MORTH 5th Revision): premixed with modified bituminous binder containing Pelletized Cellous fibre at 0.3% (on loose fibre basis) on the weight of total mix in the batch and filler(Hydrated lime dust @ 2% of weight ofaggregates, transporting the hot mix to work site, Laying with a paver finisher to the required grade, level and alignment, rolling with smooth wheeled, Vibratory and tandem rollers to achieve the desired compaction complete in all respects do- using 40/60 TPH capacity H.M.P. with mechanical paver SMA - 40mm to 50mm, compacted thickness with 5.8% VG-30 bitumen as per MORTH 5 revision clause 515.	Cum							
	(P.No.171 I.No.21.79.2 of PW,P&IWTD SR of 2018-19)								
	Main Arm		2.00	1,080.00	7.50	0.05	810.00		
							810.00		
						Say	810.00	9,379.80	75,97,638.00
	Issue rate dated 02.07.2020	8,685.00							
	Area Weightage	694.80							
	Total	9,379.80							
6.25	KSRRB M100-4.2. Haulage of materials by tipper including cost of loading, unloading and stacking complete as per specifications. MoRT&H Chapter 1 Case-I : Surface Road	Cum							
	(P.No.136, 17.1/17.4 of PW, P&IWTD SR 2018-19)								
	Qnty same as item no 6.01-6.20								
	For 14Km Rs. 2.0 X 1.28 X 14 = 35.84.		1.00	3,006.79	--	--	3,006.79	38.71	1,16,383.82
	Basic Rate	35.84							
	Area Weightage	2.87							
	Total	38.71							
								Total	69,92,14,624.81

Nagesh Consultants

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Executive Engineer
Project Central - 3
Bruhath Bengaluru Mahanagara Palike

BBMP

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
7.03	KSRRB M2100-17.2. Providing and laying Plain / Reinforced Cement Concrete design mix M25 with OPC @ 340kgs, with 20mm and down size graded granite metal coarse aggregates @0.70cum and fine aggregates @ 0.47cum, with superplasticizer @3lts confirming to IS9103-1999 Reaffirmed-2008,Open Foundation complete as per Drawing and Technical Specification including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 1500,1700 & 2100 **Retaining wall.**	Cum							
	(P.No. 223, I.No.27.31 of PW,P&IWTD S.R 2018-19)								
			4.00	5.00	3.05	0.30	18.30		
			4.00	5.00	0.25	2.50	12.50		
			4.00	5.00	0.30	0.30	1.80		
							32.60		
						Say	**33.00**	5,532.26	**1,82,564.68**
	concrete Basic Cost	4,995.00		old					
	Cement content	340.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,668.14							
	Cost Excluding Cement	3,326.86							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	340.00	kg						
	Cost of Cement	1,795.61							
	Basic new cost of concrete	**5,122.47**	Cum	NEW					
	Basic Rate	5,122.47							
	Area Weightage 8%	409.80							
	Total	5,532.26							
7.04	Providing and laying in position M35 grade pre cast concrete facia panel with architectural finish with a thickness as per approved drawing, but not less than minimum 140mm thick excluding architectural finishes and including TMT reinforcement bars as per approved drawing for reinforced earth wall using OPC which includes providing initial leveling pad as necessary (minimum 150mm thick and having suitable width) using M15 grade plain cement concrete, an aesthetic architectural finish, necessary connection arrangements for soil reinforcement (as shown in the drawing), necessary coping beam, neoprene sponge joint material between reinforced soil wall facia and crash barriers, the backfill material and the drainage material shall be separated using permeable non-woven geotextile, necessary anchor rods at the toe of wall for laying first pre cast panel including all materials, labour, lead and lift, plants, machinery, complete as per the direction of the Engineer-in-charge and copying with Technical specifications clause 3100 of MORTH specifications	Sqm							
	(P.No. 263, I.No.36.3 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		2.00	216.62	--	**4.40**	1,906.26		
	Towards Puttenahalli		2.00	69.74	--	**3.20**	446.34		

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	for RE walls behind abutments								
			1.00	17.00	--	5.75	97.75		
			1.00	17.00	--	5.80	98.60		
							2,548.94		
						Say	**2,549.00**	1,907.28	**48,61,656.72**
	Basic Rate								
	Area Weightage **8%**	1,766.00							
	Total	141.28							
		1,907.28							
7.05	Assembling, joining and laying of soil reinforcing elements connecting with precast facia panels, connecting arrangements, necessary anti corrosive coating, all materials, labour, lead and lift, plants a plants, machinery, complete as per the direction of the Engineer-in-charge and complying with Technical specifications clause 3100 of MORTH specifications								
	(P.No. 263, I.No.36.1 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli								
	(4.4 * 216.62= 955 / 1.0 (1*1 panel size) = 955 No of panel		2*2*911	6.00			22,920.00		
	Towards Puttenahalli								
	(3.2 * 69.74 = 224/ 1.0 (1.0*1.0 panel size) = 224 No of panel		2*2*224	6.00			5,376.00		
	for RE walls behind abutments								
	(5.75 * 17.0 = 98/ 1.0 (1.0*1.0 panel size) = 98No of panel		2*2*104	6.00			2,352.00		
			2*2*105	6.00			2,376.00		
	(5.8* 17.0= 98/ 1.0 (1.0*1.0 panel size) = 98 No of panel								
						Say	**33,024.00**	254.88	**84,17,157.12**
	Basic Rate	236.00							
	Area Weightage 8%	18.88							
	Total	254.88							
7.06	KSRRB M300-53. Construction of embankment with approved material Gravel/Murrum with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement Table 300-2 complete as per specifications, including cost of gravel / murrum, watering charges & compaction by vibratory roller to 95% of modified proctors density. MORTH Specification No. 305	Cum							
	(P.No.147, I.No.19.60 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		1.00	216.62	16.70	3.48	12,571.00		
	Towards Puttenahalli		1.00	69.74	16.70	2.30	2,678.71		
							15,249.71		
						Say	**15,250.00**	351.00	**53,52,750.00**
	Basic Rate	325.00							
	Area Weightage 8%	26.00							
	Total	351.00							
7.07	Construction of granular sub-base Grading-V as Sub-base and drainage layer by providing coarse graded crushed stone aggregates of granite/trap/basalt material, mixing by mix in place method by rotavator at OMC,spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the 98 % proctor density, complete as per specifications. Clause 401 of MORTH V Revision	Cum							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	(P.No.153, I.No.21.5 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		1.00	216.62	12.00	0.20	519.89		
	Towards Puttenahalli		1.00	69.74	12.00	0.20	167.38		
							687.26		
						Say	687.50	1,890.00	12,99,375.00
	Basic Rate	1,750.00							
	Area Weightage 8%	140.00							
	Total	1,890.00							
7.28	KSRRB M400-17. Providing, laying, spreading and compacting crushed stone aggregates of granite / trap / basalt to wet mix macadam specifications including pre mixing the material with water at OMC in mechanical mix plant carriage of mixed materials by tipper to site, laying in uniform layers with paver in sub-base/base course on well prepared surface and compacting with vibratory roller to achieve the desired density complete as per specifications. MORTH Specification No. 406	Cum							
	(P.No.155, I.No.20.13 PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		1.00	216.62	12.00	0.25	649.86		
	Towards Puttenahalli		1.00	69.74	12.00	0.25	209.22		
							859.08		
						Say	859.50	2,039.04	17,52,554.88
	Basic Rate	1,888.00							
	Area Weightage 8%	151.04							
	Total	2,039.04							
7.29	KSRRB M500-6. Providing and applying primer coat with S.S. bitumen emulsion on prepared surface of granular base such as WMM including cleaning of road surface and spraying primer at the rate of 0.60 kg / sqm using mechanical means complete as per specifications. Clause 502 of MORTH V revision	Sqm							
	(P.No.158, I.No.21.8 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		2.00	216.62	7.50	–	3,249.30		
	Towards Puttenahalli		2.00	69.74	7.50	–	1,046.10		
							4,295.40		
						Say	4,295.50	30.24	1,29,895.92
	Issue Rate dated 12.07.2020	28.00							
	Area Weightage 8%	2.24							
	Total	30.24							
7.30	KSRRB M500-17. Providing and laying dense graded bituminous macadam using crushed aggregates of specified grading, premixed with VG30 grade bituminous binder and, transporting the hot mix to work site, laying to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications. Clause 505 of MORTH V revision do - using 40/60 TPH capacity H.M.P. with Mechanical paver Gr-I (50 mm to 75 mm) with 4.5 % VG-30 Bitumen	Cum							
	(P.No. 160 I.No.21.17.6 of PW,P&IWTD S.R 2018-19)								
	Towards Kadrenahalli		2.00	216.62	7.50	0.085	276.19		
	Towards Puttenahalli		2.00	69.74	7.50	0.085	88.92		
							365.11		

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. [illegible]	Amount in Rs.
						Sqm	[illegible]	[illegible]	[illegible]
	Issue Rate dated 02.07.2020	6,045.00							
	Area Weightage 8%	483.60							
	Total	6,528.60							
7.11	KSRRB 500-7. Providing and applying tack coat using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications. Clause 503 of MORTH V revision	Sqm							
	(P.No.158 I.No.21.7 of PW,P&IWTD SR of 2018-19)								
	Towards Kadrenahalli		2.00	215.62	7.50	–	[illegible]		
	Towards Puttenahalli		2.00	69.74	7.50	–	[illegible]		
							[illegible]		
						Sqm	[illegible]	12.96	[illegible]
	Issue Rate dated 02.07.2020	12.00							
	Area Weightage 8%	0.96							
	Total	12.96							
7.12	Stone Matrix Asphalt (SMA) as per section 515 of MORTH 5th Revision: Providing and laying Stone Matrix Asphalt (SMA) using crushed aggregates of specified grading (as per section 515 of MORTH 5th Revision): premixed with modified bituminous binder containing Pelletized Cellous fibre at 0.3% (on loose fibre basis) on the weight of total mix in the batch and filler(Hydrated lime dust @ 2% of weight ofaggregates, transporting the hot mix to work site, Laying with a paver finisher to the required grade, level and alignment, rolling with smooth wheeled, Vibratory and tandem rollers to achieve the desired compaction complete in all respects do- using 40/60 TPH capacity H.M.P. with mechanical paver SMA - 40mm to 50mm, compacted thickness with 5.8% VG-30 bitumen as per MORTH 5 revision clause 515.	Cum							
	(P.No.171 I.No.21.79.2 of PW,P&IWTD SR of 2018-19)								
	Towards Kadrenahalli		2.00	215.62	7.50	0.05	[illegible]		
	Towards Puttenahalli		2.00	69.74	7.50	0.05	[illegible]		
							[illegible]		
						Say	215.00	9,379.80	[illegible]
	Issue Rate dated 02.07.2020	8,685.00							
	Area Weightage 8%	694.80							
	Total	9,379.80							
7.13	KSRRB M2300- For T-Beam and slabs, including launching of precast girder by launching truss upto 40m span.								

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	KSRRB M2300-10.2. Providing and Placing Reinforced / Prestressed cement concrete in super-structure as per drawing and Technical Specification complete as per specifications. RCC with OPC design mix M40 @ 420kgs, with 20mm and down size graded granite metal coarse aggregates @0.67cum and fine aggregates @ 0.44cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM, curing, form works, scaffolding and centering complete as per specifications. Height 5 m to 10 m MORTH Specification No. 1500,1600, 1700, 1800, 2300 & IS 456 Height 5m to 10m **Crash barrier with friction slab**	Cum							
	(P.No.236, I.No.29.22.2 of PW,P&IWTD S.R 2018-19)								
	CRASH BARRIER WITH Friction Slab								
	Friction Slab toward Kadrenahalli		2.00	216.62	1.10	area	476.56		
	Friction Slab toward Puttenahalli		2.00	69.74	1.10	area	153.43		
							629.99		
						Say	630.00	7,030.80	44,29,404.00
	Basic Rate	6,510.00							
	Area Weightage 8%	520.80							
	Total	7,030.80							
7.14	KSRRB M2300-14. Providing T.M.T. steel reinforcement for R.C.C. work including straightening, cutting, bending, hooking, placing in position, lapping and/or welding wherever required tying with binding wire and anchoring to the adjoining members wherever necessary complete as per design (laps, hooks and wastage shall not be measured and paid) including cost of materials, labour, HOM complete as per specifications. MORTH Specification No. 1600 & 2200	MT							
	(P.No.239, I.No.29.29.2 of PW, P&IWTD S.R 2018-19)								
	Considering 150kg/cum for crash barrier cum friction slab		--	--	--	--	94.50		
	Retaining wall 100 kg/cum		--	--	--	--	3.30		
							97.80		
						Say	98.00	67,970.88	66,61,146.24
	Basic Rate	62,936.00							
	Area Weightage 8%	5,034.88							
	Total	67,970.88							
7.15	KSRRB M2700-6. PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification complete as per specifications MORTH Specification No. 2700	Cum							
	(P.No.247, I.No.32.6 of PW, P&IWTD S.R 2018-19)								
	Towards MG Road		1.00	17.00	3.60	0.10	6.12		
	Towards Madiwala		1.00	17.00	3.60	0.10	6.12		
							12.24		
						Say	12.50	5,855.76	73,197.00
	Basic Rate	5,422.00							
	Area Weightage 8%	433.76							
	Total	5,855.76							
7.16	KSRRB M2700-7. Reinforced cement concrete M30 approach slab including reinforcement @ 70 kg/cum and formwork complete as per drawing and Technical specification including cost of materials, labour, HOM complete as per specifications. MORTH Specification No.1500, 1600, 1700 & 2704								
	(P.No.247, I.No.32.7 of PW, P&IWTD S.R 2018-19)								
	Towards MG Road		1.00	17.00	3.50	0.30	17.85		

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
	Towards Madiwala		1.00	17.00	3.50	0.30	17.85		
							35.70		
						Say	36.00	10,757.88	3,87,283.68
	Basic Rate	9,961.00							
	Area Weightage 8%	796.88							
	Total	10,757.88							
7.17	Providing and fixing Pre cast solid cement concrete kerb stones made out of C.C 1:2:4 with top and bottom width 114 and 165 mm respectively, 400mm high and 450mm in length finished with CM1:3 platering and finishing cutting, including form work, curing, including cost of all materials, labours, hire charges of machinery, loading, unloading lead and lift, transportation etc., complete	Cum							
	(P.No.27, 5.30 of PW, P&IWTD SR 2018-19)								
	towards kadrenahalli		2.00	216.62			433.24		
	towards Puttenahalli		2.00	69.74	–	--	139.48		
							572.72	Rm	
							1,273.00	Nos	
							1,273.00	440.64	5,60,934.72
	Basic Rate	408.00							
	Area Weightage 8%	32.64							
	Total	440.64							
								TOTAL	3,95,68,259.07

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Project Central - 3
Bruhath Bengaluru Mahanagara Palike

BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Detailed Cost Estimate

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
8.00	Diversion Road								
8.01	KSRRB 500-2. Cleaning the existing black topped surface with brooms, soft brushes and finally dusting with old gunny bags and / or compressed air to receive bituminous treatment including cost of all materials, labour, HOM complete as per specifications. Clause 501 of MORTH V revision	Sqm							
	(P.No.158, I.No.21.2 of PW,P&IWTD SR 2018-19)								
	along ORR		2.00	1,626.37	5.50	--	17,890.04		
	During Peak construction		2.00	2,200.00	5.50	--	24,200.00		
							42,090.04	5.40	2,27,286.22
	Basic Rate	5.00							
	Area Weightage	0.40							
	Total	5.40							
8.02	KSRRB 500-7. Providing and applying tack coat using 80/100 grade bitumen(VG10) on the prepared black topped surfaces at 2.5 kg per 10 sqm, heating bitumen in boiler fitted with spray set (excluding cleaning of road surface) including cost of all materials, labour, HOM complete as per specifications. Clause 503 of MORTH V revision	Sqm							
	(P.No.158, I.No.21.7 of PW,P&IWTD SR 2018-19)								
	along ORR		2.00	1,626.37	5.50	--	17,890.04		
	During Peak construction		2.00	2,200.00	5.50	--	24,200.00		
							42,090.04	12.96	5,45,486.92
	Issue Rate dated 02.07.2020	12.00							
	Area Weightage	0.96							
	Total	12.96							
8.03	KSRRB M500-19. Providing and laying bituminous concrete using crushed aggregates of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site, laying with paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction in all respects complete as per specifications. Clause 507 of MORTH V revision & IRC - SP - 53-2010								
	do - using40/60 TPH capacity H.M.P. with Mechanical Paver Gr-II (30 mm to 40 mm) with 5.4% CRMB 55								
	(P.No.162, I.No.21.23.6 of PW,P&IWTD SR 2018-19)								
	along ORR		2	1626.37	5.50	0.04	715.60		
	During Peak construction		2	2200.00	5.50	0.04	968.00		
							1683.60	7915.32	1,33,26,232.75
	Issue Rate dated 02.07.2020	7,329.00							
	Area Weightage	586.32							
	Total	7,915.32							

Sl No	Description of Work	Unit	No	Length (m)	Breadth (m)	Depth (m)	Quantity	Rate in Rs SR 18-19	Amount in Rs
B.04	ESSRRB M800-45 Installation of a steel portable barricade with horizontal rail 300mm wide, 2.5m in length fixed on a 'A' frame made with [illegible] angle iron section, 1.5m in height, horizontal rail painted (2coats) with yellow and white stripes 150mm in width at 45 angle of Alternating 'A' frame painted with 2 coats of yellow paint complete as per IRC SP 55 2001 complete as per specifications	Each							
	(P No 187, I No 24.44 of PW,P&IWTD SR 2018-19) [(1090)*2sides]/2.5								
	Basic Rate		872				872.00	2689.20	23,44,982.40
	Area Weightage	2,490.00							
	Total	199.20							
		2,689.20							
B.05	Supplying, fabricating, erecting, and fixing in position, inserts and embedment, Truss clamps, brackets, insert plates (Truss and Vertical Support). Manufacturing, Supply and installation of retro - reflective Over Head Gantry signboards made out of cube corner micro prismatic grade sheeting conforming to Type XI standards of IRC 67 2012 fixed over 4mm thick Aluminium Composite Panel sheet, excluding the cost of TypeXI retro reflective sheeting and 4mm Thick ACP sheet with suitable back support frame over a designed support system of aluminum alloy or galvanised steel trestles and trusses of section type as per structural design requirements and approved plans complete as per specifications. Vertical and Lateral Clearance of the Gantry shall be as per IRC 67 2012 and as per Clause 800 2.2 and 800 2.3 and installed as per clause 800 2.7.	MT							
	(P No 180, I No 24.5 of PW, P&IWTD SR 2018-19)								
	MS Sheet 2mm thick for Barricading								
	872 x 1.5 x 0.002 x 7850 =20535kg						20.54		
	Say 20.54MT					Say	21.00	76298.76	16,02,273.96
	Basic Rate	70647							
	Area Weightage	5651.76							
	Total	76298.76							
B.06	ESSRRB M800 - 46 Positioning of a smart flagman with a yellow vest and a yellow cap and a red flag 600 x 600 mm securely fastened to a staff 1 m in length for guiding the traffic complete as per specifications	Each							
	(P No 188, I No 24.49 of PW,P&IWTD 2018-19)								
	Considering 5 Nos. per day for a period of 18months (18* 30*5)		2700				2700.00	592.92	16,00,884.00
	Basic Rate	549.00							
	Area Weightage	43.92							
	Total	592.92							

Sl. No.	Description of Work	Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs. SR 18-19	Amount in Rs.
8.07	Providing and fixing Project Display Board of size 1.80 vertical x 1.60 mtrs. Horizontal made of cold rolled coil 16 Gauge (1.6mm thickness) sheeting strengthened by welding to MS angle of size 35x35x5mm iron framework on all sides, extra cross vertical angle fixed using nuts and bolts, base of the board shall be cleaned, applying red oxide	Nos.							
	and black paint by sprayer on both sides of the board and all MS iron frameworks, background of the facing side of the board painted in traffic yellow, project information written in English / Kannada / Hindi, painting letters and numeral in black, fixed on a mild steel angle iron post 75 mm x 75 mm x 6mm, 2Nos. firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60cm below ground level and the board 2.8m from ground level as per approved drawing including cost of all materials, labour, unloading, curing backfilling, transporting etc., complete.								
	(P. No.88, Item no 8.47 of NHSR 2018-19)		10	-	-	-	10.00		
							10.00	7900.00	79,000.00
								TOTAL	1,97,26,146.25

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BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

Flyover Electrical Estimate

Sl. No.	Description of Work	Unit	Quantity	Rate in Rs.	Amount in Rs.
9					
9.01	Supply of LED Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output. Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, maximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP 66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/ miss-wiring protection. Compatible for pole mouting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB. Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture with ....W System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008 . Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working under standard electrical conditions as				
	a) 150 Watts for Main Carriage Way (P.No.67, I.No.12.8.6 of SR 2019-20)	Nos	91	12300.00	11,20,940.00
	a) 150 Watts for Service Road	Nos	91	12300.00	11,20,940.00
	Basic Rate	12300			
	Area Weightage	0			
	Total	12300			
9.02	Supplying and fixing telescopic M.S.bracket fabricated by using 0.5m length 4" dia telescopic M.S.pipe with 2" dia 1.5m long M.S.bracket all are welded with suitable angle using 6mm thick M.S.sheet, grip bolt & nuts as required suitable for 9 to 12 mtrs M.S.tubular pole or octogonal pole with necessary two coats of approved painting, with all other accessories etc complete				
	a) Single bracket 1 X 1.5 Mtr.Length (P.No.79, I.No.14.4.1 of SR 2019-20)	Nos	91	1200.00	1,09,360.00
	Basic Rate	1200			
	Area Weightage	0			
	Total	1200			
	c) Double bracket 2 X 1.5 Mtr.Length (P.No.79, I.No.14.4.3 of SR 2019-20)	Nos	91	1962.00	1,78,804.00
	Basic Rate	1962			
	Area Weightage	0			
	Total	1962			

Sl. No.	Description of Work	Unit	Quantity	Rate In Rs.	Amount In Rs.
9.03	Fabricating, supplying and erecting swaged tubular pole of height ...Mtr having three sections, and providing two coats of red oxide paint and finished with two coats of enameled paint of approved quality and colour and M.S. base plate of suitable size welded at the bottom of the pole(as per IS) and 40mm dia GI / flexible PVC pipe of 1 mtr length fitted to the heavy gauge polycarbonate control box including 5way connector of size 167x125x82mm for 7.5M pole/200x160x98mm for remaining length of pole with front opening cover, with locking arrangements and suitable capacity MCB / DP switch, The pole shall be erected in cement concrete work (1:2:4) including excavation and refilling of planting depth of the pole to the ground level and the coping CC shall be up to 0.6M above ground level as per IS 2713 - 7. Erection of heavy duty pole on Footpath / median				
	10Mt (5Mt Hb,165.1mm dia 4.85mm thick x3M Hm, 139.7mm dia 4.50mm thick x 2M Ht,114.3mm dia 3.65mm thick) as per IS 410 SP 47	Nos	91	16720.00	15,23,749.00
	(P.No.13, I.No.4.1.2 of SR 2019-20)				
	Basic Rate	16720			
	Area Weightage	0			
	Total	16720			
9.04	Supply , installation,testing & commissioning of outdoor type feeder piller board with TVM meter as per power distribution schematic diagram enclosed The rates shall include all necessary foundation & civil works	No	2	71000.00	1,42,000.00
	(Market Rate)				
9.05	Wiring for lighting/power circuit using one of FRLS PVC insulated 1100V grade, multistrand Copper conductor single core wire in open or concealed system of wiring as per IS-694:1990 & confirming to GTP of GROUP -B. 4 sqmm	Mtrs	2734	45.00	1,23,030.00
	(P.No.6, I.No.2.3.4 of SR 2019-20)				
	Basic Rate	45			
	Area Weightage	0			
	Total	45			
9.06	Supplying and fixing of class A (medium duty) GI pipe of wall thickness not less than 3.25mm on pole/wall/drain crossing with necessary clamping arrangements for UG cable of 1.1 KV.50mm	Mtrs	2734	380.00	10,38,920.00
	(P.No.42, I.No.6.9.2 of SR 2019-20)				
	Basic Rate	380			
	Area Weightage	0			
	Total	380			

Sl. No.	Description of Work	Unit	Quantity	Rate in Rs.	Amount in Rs.
	ELECTRIFICATION - BOX TUNNEL				
9.07	Supply of LED Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output. Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, maximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP 66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/ miss-wiring protection. Compatible for pole mouting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB. Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture with ....W System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008 . Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working	Nos	40	12300.00	4,92,000.00
	(P.No.22, I.No.4.20 of SR 2019-20)				
	Basic Rate	12300			
	Area Weightage	0			
	Total	12300			
9.08	Fixing halogen/metal halide / SVL / IL / LED floodlight fitting over FI / wall ceiling including clamps, bolts, nuts and wiring using suitable capacity wires. Existing pole	Nos	40	175.00	7,000.00
	(P.No.79, I.No14.50 of SR 2019-20)				
	Basic Rate	175			
	Area Weightage	0			
	Total	175			
9.09	Supplying & fixing of Porcelain fuse channel with cut out on existing wooden/panel using necessary nuts, bolts and washers. 63Amps	Nos	20	227.00	4,540.00
	(P.No.25, I.No.5.7.3 of SR 2019-20)				
	Basic Rate	227			
	Area Weightage	0			
	Total	227			
9.10	Supplying and fixing of class A (medium duty) GI pipe of wall thickness not less than 3.25mm on pole/wall/drain crossing with necessary clamping arrangements for UG cable of 1.1 KV. 50mm	Rmtr	2732	380.00	10,38,160.00
	(P.No.42, I.No.6.9.2 of SR 2019-20)				
	Basic Rate	380			
	Area Weightage	0			
	Total	380			

Sl. No.	Description of Work	Unit	Quantity	Rate in Rs.	Amount in Rs.
9.11	Supplying and fixing regular MCB distribution boards on wall / wood board / flush mounting using required clamps, bolts, nuts etc., with provision for fixing suitable type capacity MCB's single phase / 3 phase / single door with powder coated painting. Made out of 14 SWG MS enclosure.I - Single Door 4Way SP &N	Nos	30	777.00	23,310.00
	(P.No.28, I.No.5.18.1 of SR 2019-20)				
	Basic Rate	777			
	Area Weightage	0			
	Total	777			
9.12	Supplying and fixing angle iron frame work fabricated out of M.S. angle iron.. and M.S. flat ... with bolts, washers etc., and painted with 2 coats of red oxide and then two coats of approved paint. 40x40x6mm	Mtrs	200	255.00	51,000.00
	(P.No.30, I.No.5.41.1of SR 2019-20)				
	Basic Rate	255			
	Area Weightage	0			
	Total	255			
	Supplying of L.T. Cables				
	Supplying of 1.1 KV LT UG cable having aluminum conductor PVC insulated, extruded inner sheathed, galvanized, steel strip (except 2CX10Sq.mm wire armoured) confirming to IS-3975:1990 (No. of Strip indicated in GTP) & extruded PVC outer sheathed armoured cable with specified IS-1554 Part-1:1988 & confirming to GTP of GROUP-A.				
9.13	3.5 core 50 sqmm	Mtrs.	400	300.00	1,20,000.00
	(P.No.41, I.No.6.4.7 of SR 2019-20)				
	Basic Rate	300			
	Area Weightage	0			
	Total	300			
9.14	3.5 core 25 sqmm	Mtrs.	400	180.00	72,000.00
	(P.No.40, I.No.6.4.5 of SR 2019-20)				
	Basic Rate	180			
	Area Weightage	0			
	Total	180			
9.15	4 core 16 sqmm	Mtrs.	1367	150.00	2,05,050.00
	(P.No.40, I.No.6.4.4 of SR 2019-20)				
	Basic Rate	150			
	Area Weightage	0			
	Total	150			
	Laying of L.T. Underground cables				
	Labour charges for laying of 1.1 KV class UG cable in existing trench GI pipe / stoneware pipe / on wall / on pole as required.In existing trench/duct.				
9.16	6 sqmm to 16 sqmm	Mtrs.	1367	11.88	16240.00
	(P.No.41, I.No.6.5.1 of SR 2019-20)				
	Basic Rate	11.88			
	Area Weightage	0			
	Total	11.88			

Sl. No.	Description of Work	Unit	Quantity	Rate in Rs.	Amount in Rs.
	End Termination of above cables with glands crimping type copper sockets.				
9.17	Supplying and fixing of heavy duty cable glands suitable for UG cable of 1.1 KV class (metal only) 50mm dia	Nos	30	255.00	7650.00
	(P.No.42, I.No.6.11.5 of SR 2019-20)				
	Basic Rate	255			
	Area Weightage	0			
	Total	255			
9.18	Supplying and fixing of heavy duty cable glands suitable for UG cable of 1.1 KV class (metal only 25mm dia	Nos	30	84.00	2,520.00
	(P.No.42, I.No.6.11.2 of SR 2019-20)				
	Basic Rate	84			
	Area Weightage	0			
	Total	84			
9.19	Supplying and fixing of heavy duty cable glands suitable for UG cable of 1.1 KV class (metal only 19/20mm	Nos	30	68.00	2,040.00
	(P.No.42, I.No.6.11.1 of SR 2019-20)				
	Basic Rate	68			
	Area Weightage	0			
	Total	68			
9.20	Supplying and fixing L.T. cast Iron pot heads suitable for 1.1 KV class UG cable filled with necessary bitumen/insulating compound complete with terminals, clamps, bolts, nuts and washers etc. 35Sqmm				
a)	(P.No.42, I.No.6.10.4 of SR 2019-20)	Nos	30	350.00	10,500.00
	Basic Rate	350			
	Area Weightage	0			
	Total	350			
b)	Supplying and fixing L.T. cast Iron pot heads suitable for 1.1 KV class UG cable filled with necessary bitumen/insulating compound complete with terminals, clamps, bolts, nuts and washers etc. 25Sqmm	Nos	30	350.00	10,500.00
	(P.No.42, I.No.6.10.3 of SR 2019-20)				
	Basic Rate	350			
	Area Weightage	0			
	Total	350			
9.21	Digging of trench of 0.6m deep x 0.50 mtr wide refilling the trench to the required ground level and consolidating etc., complete.(As per Civil SR KSRB I-2, P-7) In soil (ordinary)				
		Rmtr	500	76.00	38,000.00
	(P.No.41, I.No.6.6.1 of SR 2019-20)				
	Basic Rate	76			
	Area Weightage	0			
	Total	76			
	EARTHING				

Sl. No.	Description of Work	Unit	Quantity	Rate in Rs.	Amount in Rs.
9.22	Supplying, fixing, wiring, earth electrode for grounding conduits, I.C. cutouts and other equipment's on the meter board using 40mm dia 2.90mm thick GI pipe 2.5 mtr long buried in a pit ... The pit should be filled with equal proportion of salt and charcoal 150mm all-round the pipe to complete depth. The connection from the pipe to the conduit etc., is to be established through GI wire of size as per ISI specification 7.3.3. of IS 732 using 12mm dia bolts, nuts, washers and check nuts etc., the pipe shall have 16 through holes of 122 mm dia	Nos.	4	2999.70	11,999.00
	(P.No.40, I.No.6.1 of SR 2019-20)				
	Basic Rate	2999.7			
	Area Weightage	0			
	Total	2999.7			
9.23	Supplying and running of GI/Copper strips for grounding connections, using necessary fixing materials as required. GI strip 25x6mm	Mtrs.	684	115.00	78660.00
	(P.No.40, I.No.6.3.2 of SR 2019-20)				
	Basic Rate	115			
	Area Weightage	0			
	Total	115			
9.24	Supplying and running GI/Copper conductor for grounding and (along with other wires in conduit system of wiring) using necessary suitable size clamps, nails, guttas/spacers etc. GI Wire 8 SWG	Mtrs.	684	19.00	12996.00
	(P.No.44, I.No.6.18.3 of SR 2019-20)				
	Basic Rate	19			
	Area Weightage	0			
	Total	19			
	Miscellaneous				
9.25	Providing and laying **reinforced cement concrete pipe NP2 150mm dia** for culverts including pointing ends, and fixing collars with cement mortar 1:2 including cost of all materials, labour, curing complete as per specifications. Specifications. No. KSRB 1000, 2300	Mtrs.	60	422.28	25337.00
	(Pg No. 255, I.No.34.7.1 of PW,P&IWTD SR 2018-19)				
	Basic Rate	391			
	Area Weightage	31.28			
	Total	422.28			
9.26	Video Surveillance Systems consisting of outdoor fixed cameras, video encoders, video management software, recording servers, etc for outdoor surveillance of the construction site locally as well as from a remote location	LS	–	--	150000.00
				Total	77,37,245.00

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Nagesh consultants

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BRUHAT BANGALORE MAHANAGARA PALIKE

Name of Work : Construction of Flyover along ORR at the junction of Kanakapura Road and Sarakki Junction, Bangalore

OVER HEAD GANTRY OF SPAN 12.3M

		Unit	No.	Length m	Breadth m	Depth m	Quantity	Rate in Rs.	Amount in Rs.
10.00	OVER HEAD GANTRY OF SPAN 12.3M								
10.01	KSRRB M2100-1.1. Earth work excavation in all kinds of soils for foundation of structures as per drawing and technical specifications,including setting out, providing shoring and bracing, removal of stumpsand other deleterious matter, dressing of sides and bottom and fillingback with approved material including cost of all materials, labour, HOMcomplete as per specifications. MORTH Specification No. 304 "KSRRB M2100-2.1. -do- (i) 0 m to 3 m depth by mechanical means	Cum							
	(P.No. 220, I.No. 27.4 of PW, P & IWTD SR 2018-19)								
	Gantry								
			2.00	2.50	3.20	1.60	25.60		
			2.00	2.50	3.20	1.60	25.60		
							51.20		
	Basic Rate	50.00				Say	51.50	54.00	2,781.00
	Area Weightage 8%	4.00							
	Total	54.00							
10.02	KSRRB M2100-10. Providing and laying Plain cement concrete of mix 1:3:6 with OPC @ 220kgs, with crushed 40mm and down size graded granite metal coarse aggregates @0.89cum and fine aggregates @ 0.46cum, in foundation mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. MORTH Specification No. 2100	Cum							
	(P.No.222, I.No.27.18 of PW,P&IWTD S.R 2018-19)								
	Gantry								
			2.00	2.50	3.20	0.10	1.60		
			2.00	2.50	3.20	0.10	1.60		
							3.50		
						Say	3.50	5,613.28	19,646.47
	concrete Basic Cost	5,115.00		old					
	Cement content	220.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,079.39							
	Cost Excluding Cement	4,035.61							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	220.00	kg						
	Cost of Cement	1,161.86							
	Basic new cost of concrete	5,197.48	Cum	NEW					
	Basic Rate	5,197.48							
	Area Weightage 8%	415.80							
	Total	5,613.28							
10.03	"KSRRB M2100-14. Providing and laying Plain /Reinforcement Cement Concrete M20 with OPC @ 320 kgs, with 40mm and down size graded granite metal coarse aggregates @0.64cum and fine aggregates @ 0.43cum, with superplasticizer @3lts confirming to IS9103-1999 Reaffirmed-2008 in Open Foundation including cost of all materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications complete as per Drawing and Technical Specifications. "MORTH Specification No. 1500,1700 & 2100	Cum							
	(P.No.222, I.No.27.25 of PW, P&IWTD SR 2018-19)								
	Column footing								
			2.00	2.30	3.00	0.70	9.66		
			2.00	2.30	3.00	0.70	9.66		
							19.32		
						Say	19.50	5,837.37	1,13,828.62
	concrete Basic Cost	5,285.00		old					

	Cement content	320.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,570.02							
	Cost Excluding Cement	3,714.98							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	320.00	kg						
	Cost of Cement	1,689.98							
	Basic new cost of concrete	5,404.97	Cum	NEW					
	Basic Rate								
	Area Weightage 8%	5,404.97							
	Total	432.40							
		5,837.37							
10.04	KSRRB M2200-5.9. Providing and laying Design mix M20 with OPC @ 320kgs, with 20mm and down size graded granite metal coarse aggregates @0.69cum and fine aggregates @ 0.46cum, with superplastisiser @3lts confirming to IS9103-1999 Reaffirmed-2008 including cost of materials, labour, HOM curing, form works, scaffolding and centering complete as per specifications. - i) Upto 5 m height.	Cum							
	(P.No.227, I.No.28.7.9 of PW, P& IWTD SR 2018-19)								
	Column upto GL								
			2.00	0.85	0.85	1.40	2.02		
			2.00	0.85	0.85	1.40	2.02		
							4.05		
						Say	4.50	5,716.41	25,723.82
	concrete Basic Cost	5,173.00		old					
	Cement content	320.00	kg						
	Cement Rate / Quintal	490.63		(Sl.No 123, Code no 0084)					
	cost of cement/kg	4.91	Rs						
		1,570.02							
	Cost Excluding Cement	3,602.98							
	Cement Rate as per(Ref: office order NO.SEBC/AE-3/SR-2019-20/6917/04/01/2020	264.06							
	Rate of cement/kg	5.28							
	Cement content	320.00	kg						
	Cost of Cement	1,689.98							
	Basic new cost of concrete	5,292.97	Cum	NEW					
	Basic Rate	5,292.97							
	Area Weightage 8%	423.44							
	Total	5,716.41							
10.05	KSRRB M2200-6. Providing T.M.T. steel reinforcement for R.C.C. work including straightening, cutting, bending, hooking, placing in position, lapping and/or welding wherever required, tying with binding wire and anchoring to the adjoining members herever necessary complete as per disign (laps, hooks and astage shall not be measured and paid) cost of aterials, labour, HOM complete as per specification.MORTH Specification No.1600 & 2200 (Issue rate dated: 02.07.2020	MT							
	(P.No.229, I.No.28.8.2 of PW, P&IWTD SR 2018-19)								
	Gantry								
	Mat Reinforcement				Unit Wt/Rmt				
	Main bar 31 nos 12mm dia (X- direction)	4.00	31.00	2.90	--	0.89	320.04		
	Main bar 24 nos 12mm dia (y direction)	4.00	24.00	3.60	--	0.89	307.58		
	Top Reinforcement 21 nos 12mm dia (X- direction)	4.00	21.00	2.90	--	0.89	216.80		
	Top Reinforcement 17 nos 12mm dia (y- direction)	4.00	17.00	3.60	--	0.89	217.87		
	Column pedestal								
	Main bar 16 nos 20mm dia	4.00	16.00	2.75	--	2.47	434.72		
	Stirrups 10mm dia bar 100mm c/c								
	Horizontal 2Leg	4.00	14.00	3.40	--	0.62	118.05		
	2 leg	8.00	14.00	2.55	--	0.62	177.07		
						Sub Total	1,792.14		
	Add 5% for Wastage						89.61		
						Total	1,881.75		
						Qty in MT	1.88		

	for 2 gantry								
						Say	2.00	73,691.64	1,47,383.28
	Basic Rate	68,233.00							
	Area Weightage 8%	5,458.64							
	Total	73,691.64							
10.06	KSRRB M800-5.1. Over head Signs (Truss and Vertical Support): Manufacturing, Supply and installation of retro reflective Over-Head Gantry signboards made out of cube corner micro prismatic grade sheeting confirming to Type XI standards of IRC:67:2012 fixed over 4mm thick Aluminium Composite Panel sheet, excluding the cost of TypeXI retro-reflective sheeting and 4mm Thick ACP sheet with suitable back support frame over a designed support system of aluminum alloy or galvanised steel trestles and trusses of section type as per structural design requirements and approved plans complete as per specifications. Vertical and Lateral Clearance of the Gantry shall be as per IRC 67 2012 and as per Clause 800.2.2 and 800.2.3 and installed as per clause 800.2.7.	MT							
	(P.No.180, I.No.24.5 of PW, P&IWTD SR 2018-19)								
	Structural steel on pedestal								
	M S Base plate 24mm thick (2nos) each pedestal					Unit Wt/Rmt			
	4x0.85mx0.85mx0.024mx2x7850kg/cum = 1088.95 kgs		--	--	--	--	1,088.95		
	Anchor bolt 25mm dia 12 nos 3.86 kg/No		8.00	12.00	--	3.86	370.56		
	Stiffner plate 12mm thick 4 nos per each pedestal								
	Vertical Plate								
	NB 300 (92.3kg/m) Vertical post		4.00	6.10	--	92.30	2,252.12		
	NB 300 (92.3kg/m) Horizontal post		2.00	12.70	--	92.30	2,344.42		
	Stiffners								
	4x8X0.25mx0..25mx0.012mx7850kg/cum = 188.4 kgs		--	--	--	--	188.40		
	Vertical structural sections								
	NB 65 (7.93kg/m) Vertical post		4.00	16.00	1.20	7.93	609.02		
	Horizontals								
	NB 65 (7.93kg/m) post		4.00	2.00	12.95	7.93	821.55		
	Diagonal sections								
	NB 65 (7.93kg/m) post		4.00	13.00	1.53	7.93	630.91		
	Gusset Plate								
	A-type Vertical Joint								
	2x32X0.3mx0.4mx0.008mx7850kg/cum = 482.3 kgs		--	--	--	--	482.30		
	B-type Top Horizontal Joint								
	2x6X0.15mx0.15mx0.008mx7850 kg/cum = 16.96 kgs		--	--	--	--	16.96		
						Total	8,805.19		
						Qty in MT	8.81		
	for 2 gantry								
						Say	9.00	76,298.76	6,86,688.84
	Basic Rate	70,647.00							
	Area Weightage 8%	5,651.76							
	Total	76,298.76							
10.07	KSSRB M800-5.2 Over Head Sign Board : Supply and installation of retro- reflective Over-Head Gantry sign boards made out of cube corner micro prismatic grade sheeting confirming to Type XI standards of IRC:67:2012 specification & fixed over 4mm thick Aluminium Composite Panel sheet having minimum 0.30 mm thick aluminum skin on both sides excluding the cost of back support frame, vertical support and horizontal support and foundation. as directed by the engineer incharge of the work.	Sqm							
	(P.No.181, I.No.24.6 of PW,P&IWTD SR 2018-19)								
	Covering of truss		1.00	12.95	--	1.20	15.54		
	Top		1.00	12.95	--	1.20	15.54		
							31.08		
							31.50	10,287.00	3,24,040.50
	Basic Rate	9,525.00							
	Area Weightage 8%	762.00							
	Total	10,287.00							

	KSRB 15.18.1: Applying red lead ready mix priming coat over new steel or other metal surface including preparing the surface after throughly cleaning oil, grease, dirt and othe foreign matter, and scoured with wire brushes, fine steel wool, sand papers including cost of materials, labour, complete as per specifications.	Sqm							
	(P.No.123, I.No.15.73 of PW,P&IWTD SR 2018-19)								
	Gantry								
	Top Truss		2.00	12.95	–	1.20	31.08		
	Covering Truss								
	Ms Plate 5mm thick @ 39.2 kg/Sqm		2.00	12.95	–	1.20	31.08		
							62.16		
	for 2 gantry						124.32		
						Say	124.50	44.28	5,512.86
	Basic Rate	41.00							
	Area Weightage 8%	3.28							
	Total	44.28							
10.09	KSRB 15.18.2: Providing and applying enamel metal paint two coats (Excluding priming coat) over new steel or other metal surface brushing to give an even shade after cleaning oil, grease, dirt and other foreign matter, including cost of materails, labour, complete as per specifications	Sqm							
	(P.No.123, I.No.15.74 of PW,P&IWTD SR 2018-19)								
	Quantity same as Primer Coat		–	–	–	–	31.50	102.60	3,231.90
	Basic Rate	95.00							
	Area Weightage 8%	7.60							
	Total	102.60							
10.10	KSRB 2.4: Refilling availabie excavated earth around pipe lines, cables in layers not exceeding 20cms in depth, compacting earth deposited layer by ramming after watering with lead upto 50m and lift upto 1.5m including cost of all labour complete as per specfiications.	Cum							
	(P.No.7, I.No.2.11 of PW,P&IWTD SR 2018-19)								
			–	–	–	–	28.50	130.68	3,724.38
	Basic Rate	121.00							
	Area Weightage 8%	9.68							
	Total	130.68							
10.11	KSRRB M100-4.1: Cost of Haulage including loading and unloading of stone Boulder / Stone aggregates / Sand /Kankar / Moorum KSRRB M100-1: Placing tipper at loading point, loading with front end loader, dumping, turning for return trip, excluding time for haulage and return trip complete as per specifications. MORTH Chapter 1 (dumping yard Anjanapura)	Cum							
	conveying up to 14km by mechanical means.								
	(P.No.136, 17.1/17.4 of PW, P&IWTD SR 2018-19)			–	–	–	23.00	38.71	890.26
	For 14Km Rs. 2.0 X 1.28 X 14 = 35.84								
	Basic Rate	35.84							
	Area Weightage 8%	2.87							
	Total	38.71							
					Sub Total for 1 No of Gantry				13,33,451.93
					Grand Total for 2 No of Gantry				26,66,903.85

Nagesh Consultants
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Assistant Executive Engineer
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Bangalore - 560 002

Executive Engineer
Project Central - 3

APPENDIX – 2.

GEOTECHNICAL INVESTIGATION REPORT

ISO No.	QMP 8.2.4 R/A
Report No.	GECPL/030620-067/R

GEOTECHNICAL INVESTIGATION REPORT FOR THE PROPOSED CONSTRUCTION OF FLY OVER ALONG ORR AT THE JUNCTION OF KANAKAPURA ROAD AND SARAKKI JUNCTION, BENGALURU

CLIENT

M/s. Bruhat Bengaluru Mahanagara Palike,

Bengaluru

CONSULTANTS

M/s. Nagesh Consultants,

# 2, 6th Cross,

Ashok Nagar, BSK I Stage,

Bengaluru – 560 050

GEO-ENGINEERING COMPANY PVT. LTD.

#28, 5th Main, 3rd Phase, Peenya Industrial Area, Behind Bescom,

Bengaluru - 560 058

Report on : Geotechnical Investigation For The Proposed Construction of Fly Over Along ORR at the Junction of Kanakapura Road and Sarakki Junction, Bengaluru

Report No : GECPL/030620-067/R

Report for : M/s. Bruhat Bengaluru Mahanagara Palike, Bengaluru

Reference : Telephonic Confirmation

Managing Director : Dr. Jayaprakash K N

Technical Advisor : Mr. Umesh Kumar N
Technical Manager (Geo-Technical Engg)

Report By : Mr. Nagesh C

Field investigation carried out by : Mr. Bharath Das & Team
Site Engineer's

Date of submission of report : 02.07.2020

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LIST OF ANNEXURES

List of Annexure	**Description**
Annexure I -	Bore Hole Location
Annexure II -	Field Records and Bore Logs
Annexure III -	Laboratory Testing
Annexure IV-	Grain Size Distribution Curves

1.0 INTRODUCTION

M/s. Bruhat Bengaluru Mahanagara Palike. Bengaluru had entrusted us to carry Geotechnical investigation for the proposed Construction of flyover along ORR at the Junction of Kanakapura Road and Sarakki Junction, Bengaluru. The primary objective of this investigation is to establish the geotechnical condition at the site and to evaluate the allowable bearing pressure and other engineering design parameters through the various field and laboratory tests. This report consists of the details about the field and laboratory tests performed and the recommendations made based on the test results.

2.0 SCOPE

Field work comprising of drilling of Six boreholes conducting SPT tests, collection of samples started on 03.06.2020 and was completed on 25.06.2020. The primary objective of this investigation was to obtain information about the sub-surface conditions at the site and obtain net allowable bearing pressure for design of foundations. Fig A: shows the location of boreholes for the proposed construction site ***(Refer Annexure I)***.Borehole details are summarized below:

BH No.	Depth of explorations (m)	Ground Water Table, (m)
BH-1	23.0	Nil
BH-2	22.0	Nil
BH-3	10.5	Nil
BH-4	10.5	Nil
BH-5	25.0	Nil
BH-6	16.5	Nil

3.0 FIELD INVESTIGATION- RELEVANT DESCRIPTION

3.1 Boring and Drilling

The field investigation comprised of advancing 150mm boreholes using rotary drilling rig with bentonite mud circulation. Standard penetration test (SPT) was conducted at every 1.50m intervals as per IS: 2131. The number of blows for 30cm penetration of split spoon sampler was recorded as N-values. The boreholes were terminated after drilling to their respective depth. The various sub-surface strata are presented in the respective bore charts.

3.2 Standard Penetration Test (SPT) in boreholes

Standard Penetration Test (SPT) to determine penetration resistance was conducted in the boreholes using the procedure described in IS: 2131. In this method, driving bit is replaced by split spoon sampler (50.8 mm OD and 35 mm ID) and the sampler is driven by dropping 63.5 kg hammer on the top of the driving collar with a free fall of 75 cm. The length of the sampler is 60 cm. The sampler is first driven through 15 cm as "Seating Drive". It is further driven through 30 cm. The number of blows required to drive the sampler for 30 cm beyond seating drive is termed as "Penetration Resistance, N". Representative samples were collected using split spoon sampler. Where full 30cm penetration beyond seating drive was not possible, number of blows and corresponding penetration is mentioned in bore logs. ***Refer Annexure II for Bore logs.***

3.3 Sampling in boreholes

3.3.1 Sampling is soil/completely weathered rock

In view of sandy Silt/completely weathered rock, representative samples were mainly collected from split spoon sampler used for conducting SPT at close intervals of 1.5m up to end of respective strata.

3.3.2 Sampling in rock formations

In boreholes where rock cores could be recovered, same was logged, placed sequentially in good quality wooden core boxes. Individual core piece lengths were measured and core recovery and Rock quality designation computed as under.

Rock core recovery {CR % = (Length of Core / Length of run) x 100}

Rock quality designation (RQD) = (Total length of core pieces of >100mm / length of run) x 100}. Same is reflected in respective bore logs.

3.4 Ground water table

At time of investigations, subsequent to completion of borehole and after allowing water level to stabilize for minimum 24 hours, water table/Seepage water was not encountered at any depth below natural ground level during the time of investigation; however, a point to be noted is that, water levels are invariably subjected to seasonal fluctuations.

4.0 LABORATORY TESTS ON SAMPLES

Assessment of Geotechnical Properties - Samples from Boreholes

The following Tests were carried out

- Grain size analysis
- Natural Moisture content
- Atterberg's Limits
- UCS test on Rock Sample

Test results are as shown in Annexure III

5.0 SUB - SOIL PROFILE ANALYSIS

5.1 Nature of Soil Stratification

Based on detailed analysis, the soil conditions described is summarized for the entire project site as under

Layer I: Soil Overburden

The sub-soil stratification essentially comprises of sandy Silt/ silty sand/filled up formations with layer thickness of 6.0 – 22.0m.

Layer II: Completely weathered rock (Soft Disintegrated rock)

Occurs below layer I and comprises of 'very dense' complete to highly weathered rock (SPT 'N' values consistently N >100 and Nil core recovery). In 'in-situ' conditions, stratum is considered 'very dense/stiff' /incompressible with very good bearing characteristics. In this layer sample recovery was limited and sufficient for visual classification only.

Layer III- Rock formations

This layer occurs below the Layer II. Based on the core recovery and rock Quality Designation rock may classified as Soft Rock/Moderately Weathered Rock/Hard rock formations given below.

5.2 Sub-Soil stratification Description:

BH No.	Explored Depth, m	Thickness of layer in sequence (m)			
		Layer – I	Layer – II	Layer III-	
		Soil/CWR(N<100)	CWR(N>100)	Rock Formations	Remarks
BH-1	23.0	0.0 to 6.0	6.0 to 16.5	16.5 to 23.0	SR/HR
BH-2	22.0	0.0 to 6.0	6.0 to 16.5	16.5 to 22.0	SR/HR
BH-3	10.5	0.0 to 7.5	7.5 to 8.0	8.0 to 10.5	SR/HR
BH-4	10.5	0.0 to 7.0	--	7.0 to 10.5	SR/HR
BH-5	25.0	0.0 to 22.5		22.5 to 25.0	SR
BH-6	16.5	0.0 to 13.5	13.5 to 16.5	--	--

SR- Soft Rock, HR- Hard Rock CWR- Completely Weathered Rock,

6.0 RECOMMENDATIONS FOR DESIGN OF FOUNDATIONS

6.2.1 Inferences drawn from borehole investigations

Heavy load transfer is anticipated from the Bridge structure envisaged. Hence deep foundations such as Bored Cast-in-situ Piles may be recommended. Pile diameter has been considered as 1.0m, 1.1m and 1.2m. Piles should be socketed **3 times the Pile diameter in dense weathered rock /refusal strata (N>100) layer (or) 1.0 times the Pile diameter in Soft Rock (CR>30%) whichever is met earlier.**

6.2.2 Recommendations for Deep Foundations

Borehole Location	Diameter, mm	Axial Capacity, tones	Lateral Capacity of pile, tones	Uplift Capacity of pile, tones	Depth of occurrence of CWR(N>100) /Rocky Strata from NGL, m	Min. depth of fixity, m	Min. Length of socketing, m	Total Depth of Pile below NGL, m
BH-1 & 2	1000	300	35	100	6.0	8.0	3.0	11.0
	1100	350	40	120		8.5	3.3	12.0
	1200	400	48	140		9.0	3.6	13.0
BH-3	1000	300	35	100	8.0	8.0	1.0	9.0
	1100	350	40	120		8.5	1.1	9.5
	1200	400	48	140		9.0	1.2	10.5

BH-4	1000	300	35	100	7.0	8.0	2.0	10.0
	1100	350	40	120		8.5	2.1	10.5
	1200	400	48	140		9.0	2.2	11.5
BH-5	1000	300	35	100	22.5	8.0	3.0	25.5
	1100	350	40	120		8.5	3.3	26.0
	1200	400	48	140		9.0	3.6	26.5
BH-6	1000	300	35	100	13.5	8.0	3.0	16.5
	1100	350	40	120		8.5	3.3	17.0
	1200	400	48	140		9.0	3.6	17.5

However actual load carrying capacity of pile may be arrived by conducting Initial Pile load Test

NGL-Natural Ground Level

NOTE

a. The total depth of the pile is the sum of either (Minimum depth of fixity + Minimum Socketing length) or (Depth of occurrence of hard strata + Minimum socketing length), whichever is maximum.

b. Concreted pile lengths are estimated based on Borehole data. Actual Length of piles may vary. During actual execution, pile termination shall be decided based on chiseling / PPR deduced by SPT 'N' value or any approved criteria. Broad description of PPR criteria related to SPT N is given below

c. **Pile Termination reconfirmation**-For reconfirming the strata at pile termination level (socket strata) Chiseling criteria or Pile Penetration Ratio recommended in IRC-78 may be used

Pile Penetration ratio (PPR) reflects the energy in ton-m required to advance pile bore of $1 m^2$ cross sectional area by 1cm or 10mm. SPT Tests are used to assess this and minimum N Value /blow count of 100 may be used as a guideline

From SPT Test for N=100 (Indicative calculation)

Energy E Spent for N blows =63.5kgx 75cm x N Blows

Area of SPT Sampler = $\pi D^2/4 = 0.785 \times 25.81 = 20.26 cm^2$

D =5.08 cm Outer diameter (Standard samplers)

For N=100, Energy E = $63.5 \times 75 \times 100 \times 10^{-5}$ t-m

CONCLUDING REMARKS

This Geotechnical report is valid for site conditions that prevailed at time of subsurface explorations. Geo-technical design recommendations are based on the data derived from borehole investigations. There is a possibility that strata variations could occur. If any variations indicate significant deviations from the findings of this report, same shall be brought to the notice of Geo-technical consultant for appropriate design review.

For GEOENGINEERING COMPANY-PRIVATE LTD

Jayaprakash

(Dr. JAYAPRAKASH K N)

ANNEXURE I

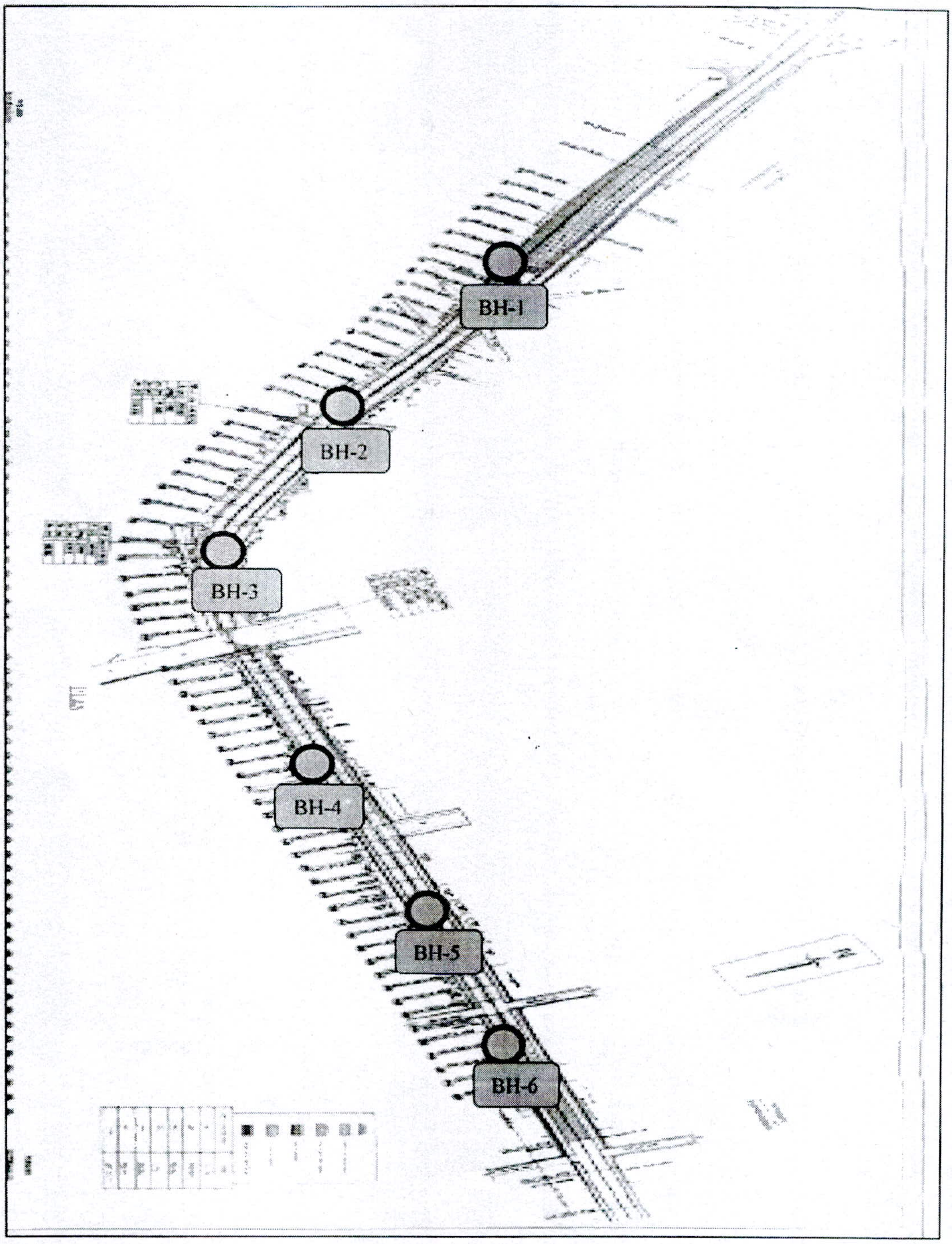

Fig A: Location of Bore holes

ANNEXURE II

Client	M/s BBMP	**BOREHOLE - 01**	**Size of Borehole**	150mm
Job No	67		**Ground Water Table**	Nil
Project	Construction of Fly Over		**Commenced**	03-06-20
Location	Sarakki Signal, JP Nagar 6th Phase		**Completed**	06-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
				1st 15cm	**2nd15cm**	**3rd15cm**				
				N_1	**N_2**	**N_3**				
Filled Up	0.5									
	1.5									
	3.0		SPT DS	8	10	15	25			
	4.5		UDS							
Yellowish brown CWR	6.0	▨	SPT DS	55B/8cm	R		>100			*Refusal Strata*
Yellowish gray CWR	7.5	▨	WS	R			>100			
	9.0	▨	WS	R			>100			
	10.5	▨	WS	R			>100			
	12.0	▨	WS	R			>100			
	13.5	▨	WS	R			>100			
	15.0	▨	WS	R			>100			
	16.5	▨	WS	R			>100			
Brownish yellow Soft Rock	18.0	▤	CR					<10	Nil	
Blackish to whitish yellow soft Rock	19.5	▤	CR					13	Nil	
	21.0	▤	CR					22	13	
Blackish gray Hard Rock	23.0	▤	CR					68	60	

SPT=Standard Penetration test	Refusal means SPT N>50	B= No. of blows	R=Rebound	SR: Soft Rock
HR:Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock	SDR: Soft Disintegrated Rock	

Bore hole was terminated at 23.0m depth below existing ground level

BOREHOLE - 02

Client	M/s BBMP	**Size of Borehole**	150mm
Job No	07	**Ground Water Table**	Nil
Project	Construction of Fly Over	**Commenced**	07-06-20
Location	Sarakki Signal, JP Nagar 6th Phase	**Completed**	10-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
				1^{st} 15cm	2^{nd} 15cm	3^{rd} 15cm				
				N_1	N_2	N_3				
Filled Up	0.5									
	1.5									
Yellowish sandy Silt	3.0		SPT DS	20	22	30	52			*Refusal Strata*
Brownish yellow sandy Silt	4.5		SPT DS	25	35	50	85			
Yellowish brown CWR	6.0	▨	SPT DS	55B/8cm	R		>100			
Grayish yellow CWR	7.5	▨	WS	R			>100			
	9.0	▨	WS	R			>100			
	10.5	▨	WS	R			>100			
	12.0	▨	WS	R			>100			
	13.5	▨	WS	R			>100			
	15.0	▨	WS	R			>100			
	16.5	▨	WS	R			>100			
Brownish yellow Soft Rock	18.0	▤	CR					19	14	
Brownish to whitish yellow Soft Rock	19.5	▤	CR					23	10	
	21.0	▤	CR					74	62	
Grayish white Hard Rock	22.0	■	CR					83	62	

SPT=Standard Penetration test | Refusal means SPT N>50 | B= No. of blows | R=Rebound | SR: Soft Rock

HR:Hard Rock | DS=Disturbed Sample | CWR: completely weathered rock | SDR: Soft Disintegrated Rock

Bore hole was terminated at 22.0m depth below existing ground level

Client	M/s BBMP	**BOREHOLE - 03**	**Size of Borehole**	150mm
Job No	67		**Ground Water Table**	Nil
Project	Construction of Fly Over		**Commenced**	13-06-20
Location	Sarakki Signal, JP Nagar 6th Phase		**Completed**	15-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N_1	**N_2**	**N_3**				
Filled Up Soil	0.5									
Grayish black silty Sand	1.5		SPT DS	3	5	8	13			
	3.0		SPT DS	5	8	10	**18**			
	4.5		UDS							
Yellowish brown sandy Silt	6.0	░	SPT DS	20	25	30	55			***Refusal Strata***
Whitish gray CWR	7.5	▩	SPT DS	55B /15cm	R		>100			
	8.0	▩								
Yellowish white Soft Rock	9.0	▤	CR					31	21	
Grayish to white Hard Rock	10.5	▤	CR					43	38	

SPT=Standard Penetration test
Refusal means SPT N>50
B= No. of blows
R=Rebound
SR: Soft Rock
HR:Hard Rock
DS=Disturbed Sample
CWR: completely weathered rock
SDR: Soft Disintegrated Rock

Bore hole was terminated at 10.5m depth below existing ground level

Client	M/s BBMP	**BOREHOLE - 04**	**Size of Borehole**	150mm
Job No	67		**Ground Water Table**	Nil
Project	Construction of Fly Over		**Commenced**	13-06-20
Location	Sarakki Signal, JP Nagar 6th Phase		**Completed**	15-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N_1	N_2	N_3				
Filled Up Soil	0.5									
	1.5									
Yellowish brown sandy Silt	3.0	░	SPT DS	3	5	7	12			
	4.5	░	SPT DS	5	7	9	16			
Yellowish gray sandy Silt	6.0	░	SPT DS	7	9	12	21			
Brownish yellow CWR	7.0	▩	SPT DS	55B /15cm	R		>100			***Refusal Strata***
Blackish yellow Soft Rock	8.5	▤	CR					11	Nil	
Blackish gray Hard Rock	10.5	▤	CR					57	46	

SPT=Standard Penetration test	Refusal means SPT N>50	B= No. of blows	R=Rebound	SR: Soft Rock
HR.Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock	SDR: Soft Disintegrated Rock	

Bore hole was terminated at 10.5m depth below existing ground level

Client	M/s BBMP	**BOREHOLE - 05**	**Size of Borehole**	150mm
Job No	67		**Ground Water Table**	Nil
Project	Construction of Fly Over		**Commenced**	21-06-20
Location	Sarakki Signal, JP Nagar 6th Phase		**Completed**	25-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded** 1st 15cm N_1	2nd 15cm N_2	3rd 15cm N_3	**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
Filled Up Soil	0.5									
	1.5									
Brownish sandy Silt	3.0		UDS							
Yellowish gray sandy Silt	4.5		SPT DS	10	14	20	34			
	6.0		SPT DS	15	20	25	45			
Yellowish to grayish brown sandy Silt	7.5		SPT DS	12	16	21	37			
Brownish to whitish gray sandy Silt	9.0		SPT DS	15	22	24	46			
Brownish gray sandy Silt	10.5		SPT DS	15	20	30	50			
Yellowish sandy Silt	12.0		SPT DS	10	15	19	34			
	13.5		SPT DS	12	16	19	35			
Yellowish brown sandy Silt	15.0		SPT DS	10	12	15	27			
Reddish to grayish yellow sandy Silt	16.5		SPT DS	8	8	15	23			
	18.0		SPT DS	9	9	17	26			
Brownish yellow sandy Silt	19.5		SPT DS	25	25	30	55			***Refusal Strata***
	21.0		SPT DS	30	35	50	85			
Whitish to grayish yellow CWR	22.5	▨	SPT DS	50B/0cm	R		>100			
Blackish brown Soft Rock	24.0	▤	CR					<10	Nil	
	25.0	▤	CR					<10	Nil	

SPT=Standard Penetration test | Refusal means SPT N>50 | B= No. of blows | R=Rebound | SR: Soft Rock

HR: Hard Rock | DS=Disturbed Sample | CWR: completely weathered rock | SDR: Soft Disintegrated Rock

Bore hole was terminated at 25.0m depth below existing ground level

Client	M/s. BBMP	**BOREHOLE - 06**	**Size of Borehole**	150mm
Job No	67		**Ground Water Table**	Nil
Project	Construction of Fly Over		**Commenced**	25-06-20
Location	Sarakki Signal, JP Nagar 6th Phase		**Completed**	25-06-20

Description of Sub-soil stratum	**Depth (m)**	**Legend**	**Sample**	**SPT TEST, number of blows recorded**			**N Value = N_2+N_3**	**Core Recovery, %**	**RQD, %**	**Remarks**
				1st 15cm	**2nd 15cm**	**3rd 15cm**				
				N_1	**N_2**	**N_3**				
Filled Up Soil	0.5									
	1.5									
Grayish to yellowish brown sandy Silt	3.0		SPT DS	4	6	9	15			
Grayish yellow sandy Silt	4.5		SPT DS	6	9	12	21			
	6.0		SPT DS	12	17	22	39			
Whitish yellow sandy Silt	7.5		SPT DS	10	11	12	23			
Yellowish red sandy Silt	9.0		SPT DS	12	15	19	34			
Greenish sandy Silt	10.5		SPT DS	5	6	8	14			
	12.0		SPT DS	11	16	21	37			
Blackish green CWR	13.5	▨	SPT DS	55B/15cm	R		>100			*Refusal Strata*
Blackish grayish white CWR	15.0	▨	WS	50B/0cm	R		>100			
	16.5	▨	WS	R			>100			

SPT=Standard Penetration test	Refusal means SPT N>50	B= No of blows	R=Rebound	SR: Soft Rock
HR:Hard Rock	DS=Disturbed Sample	CWR: completely weathered rock	SDR: Soft Disintegrated Rock	

Bore hole was terminated at 16.5m depth below existing ground level

GEO ENGINEERING COMPANY PVT. LTD.

LABORATORY TEST REPORT ON SOIL SAMPLES

Client	M/s. Bruhat Bengaluru Mahanagara Palike,	Project	Construction of flyover	Job No.	067
Location	Sarakki Signal	Date of Sample Recived	25-06-20	Date of Test	29-06-20

ANNEXURE III

BH No.	Sample Type	Sample no.	Depth (m)	Grain Size Distribution (%)					Atterberg Limits (%)			Free Swell Index (%)	IS Classification (IS:1498-1970)	Natural Moisture Content (%)	Bulk Density (gm/cc)*	Specific Gravity*	Shear Parameters		Description of Soil Strata
				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Liquid Limit	Plastic Limit	Plasticity Index						Cohession (kN/m^2)	Angle of Internal Friction (deg.)	
1	SPT	067/1	3.0	10.5	15.8	25.7	19.5	28.5	---	---	---	---	---	13.9	---	---	---	---	silty Sand with gravel
	SPT	067/2	4.5	12.9	19.8	28.5	22.1	16.7	27.3	---	NP	---	SM	14.1	---	---	---	---	silty Sand with gravel
	SPT	067/3	7.5	0.1	29.9	65.0	4.1	0.9	---	---	---	---	---	10.2	---	---	---	---	sandy Soil
	SPT	067/4	12.0	0.0	34.0	57.8	5.5	2.7	---	---	---	---	---	8.3	---	---	---	---	sandy Soil
	SPT	067/5	15.0	0.0	37.2	61.7	0.3	0.8	---	---	---	---	---	0.8	---	---	---	---	sandy Soil
	SPT	067/6	16.5	0.1	21.2	71.5	6.4	0.8	---	---	---	---	---	13.7	---	---	---	---	sandy Soil
2	SPT	067/7	3.0	2.1	5.5	32.4	23.9	36.1	37.7	---	NP	---	SM	14.8	---	---	---	---	silty Sand
	SPT	067/8	4.5	0.2	1.5	31.7	23.6	43.0	---	---	---	---	---	14.2	---	---	---	---	silty Sand
	SPT	067/9	6.0	0.2	6.8	28.4	25.2	39.4	---	---	---	---	---	15.6	---	---	---	---	silty Sand
	SPT	067/10	7.5	0.0	0.3	39.1	26.2	34.4	---	---	---	---	---	0.6	---	---	---	---	silty Sand
	SPT	067/11	10.5	0.0	0.1	68.5	28.8	2.6	---	---	---	---	---	6.0	---	---	---	---	sandy Soil
	SPT	067/12	13.5	0.0	0.2	73.6	24.1	2.1	---	---	---	---	---	0.9	---	---	---	---	sandy Soil
	SPT	067/13	16.5	0.0	0.2	70.2	27.8	1.8	---	---	---	---	---	0.4	---	---	---	---	sandy Soil

BH No.	Sample Type	Sample no.	Depth (m)	Grain Size Distribution (%)					Atterberg Limits (%)			Free Swell Index (%)	IS Classification (IS:1498-1970)	Natural Moisture Content (%)	Bulk Density (gm/cc)*	Specific Gravity*	Shear Parameters		Description of Soil Strata
				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Liquid Limit	Plastic Limit	Plasticity Index						Cohession (kN/m^2)	Angle of Internal Friction (deg.)	
3	SPT	067/14	1.5	0.9	4.2	35.5	32.0	27.4	31.1	---	NP	---	SM	13.4	---	---	---	---	silty Sand
	SPT	067/15	3.0	2.0	1.5	31.7	23.6	41.2	---	---	---	---	---	9.7	---	---	---	---	silty Sand
	SPT	067/16	4.5	5.3	5.1	25.1	31.1	33.4	---	---	---	---	---	17.6	---	---	---	---	silty Sand
	SPT	067/17	6.0	1.5	1.2	28.6	37.9	30.8	---	---	---	---	---	15.9	---	---	---	---	silty Sand
	SPT	067/18	7.5	0.1	2.4	29.2	33.5	34.8	---	---	---	---	---	12.0	---	---	---	---	silty Sand
4	SPT	067/19	3.0	0.0	0.8	18.9	35.4	44.9	36.0	14.7	21.3	---	SC	21.5	---	---	---	---	silty Sand
	SPT	067/20	4.5	2.2	4.8	22.1	36.1	34.8	---	---	---	---	---	22.7	---	---	---	---	silty Sand
	SPT	067/21	6.0	4.8	3.2	22.2	32.7	37.1	---	---	---	---	---	19.8	---	---	---	---	silty Sand
	SPT	067/22	7.5	9.1	33.2	47.3	7.3	3.1	---	---	---	---	---	6.0	---	---	---	---	sandy Soil
5	SPT	067/23	3.0	1.8	6.0	15.5	23.5	53.2	34.1	15.3	18.8	---	CL	21.8	---	---	---	---	sandy Silt
	SPT	067/24	4.5	1.6	11.6	19.4	13.7	53.7	---	---	---	---	---	14.1	---	---	---	---	sandy Silt
	SPT	067/25	7.5	1.7	14.6	16.6	11.2	55.9	---	---	---	---	---	25.1	---	---	---	---	sandy Silt
	SPT	067/26	10.5	1.8	8.8	30.2	19.3	39.9	---	---	---	---	---	24.9	---	---	---	---	silty Sand
	SPT	067/27	12.0	0.0	0.1	3.2	36.7	60.0	---	---	---	---	---	36.1	---	---	---	---	sandy Silt
	SPT	067/28	15.0	0.0	1.5	8.0	12.4	78.1	---	---	---	---	---	36.1	---	---	---	---	sandy Silt
	SPT	067/29	18.0	0.0	0.2	8.5	15.0	76.3	---	---	---	---	---	35.6	---	---	---	---	sandy Silt
	SPT	067/30	21.0	0.0	3.0	20.1	23.3	53.6	---	---	---	---	---	24.2	---	---	---	---	sandy Silt
	SPT	067/31	22.5	0.9	25.7	64.3	6.9	2.2	---	---	---	---	---	4.7	---	---	---	---	sandy Soil

BH No.	Sample Type	Sample no.	Depth (m)	Grain Size Distribution (%)					Atterberg Limits (%)			Free Swell Index (%)	IS Classification (IS:1498-1970)	Natural Moisture Content (%)	Bulk Density (gm/cc)*	Specific Gravity*	Shear Parameters		Description of Soil Strata
				Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt & Clay	Liquid Limit	Plastic Limit	Plasticity Index						Cohession (kN/m^2)	Angle of Internal Friction (deg.)	
6	SPT	067/32	3.0	0.6	1.0	19.9	28.7	49.8	38.6	---	NP	---	MI	22.1	---	---	---	---	sandy Silt
	SPT	067/33	4.5	0.2	0.3	26.4	30.2	42.9	---	---	---	---	---	18.5	---	---	---	---	silty Sand
	SPT	067/34	6.0	0.0	4.4	28.5	17.6	49.5	---	---	---	---	---	24.1	---	---	---	---	sandy Silt
	SPT	067/35	9.0	0.0	0.1	18.1	29.7	52.1	---	---	---	---	---	21.4	---	---	---	---	sandy Silt
	SPT	067/36	10.5	0.0	0.0	7.7	22.9	69.4	---	---	---	---	---	45.3	---	---	---	---	sandy Silt
	SPT	067/37	13.5	0.0	0.0	26.2	41.7	32.1	---	---	---	---	---	23.1	---	---	---	---	silty Sand
	SPT	067/38	16.5	4.7	15.3	62.9	16.2	0.9	---	---	---	---	---	15.3	---	---	---	---	sandy Soil

This report relates only to the sample tested and shall not be reproduced except in full without written approval of laboratory management

Jayaprakash

Authorised Signatory

DR. JAYAPRAKASH K.N.
MANAGING DIRECTOR

Abrreviations used: UDS: Undisturbed Sample, DS: Disturbed Sample, SPT: Standard Penetration Test, BH: Bore Hole, NP: Non Plastic

Test Method Referred to:	Grain Size Distribution: IS 2720-4 1985 RA 2015	Liquid and Plastic Limit: IS 2720-5 1985 RA 2015	Specific Gravity: IS 2720-3 SECTION 1 & 2 1980 RA 2011
	Direct Shear Test: IS 2720-13 1986 RA 2015	Free Swell Index: IS 2720-40 1977 RA 2011	Natural Moisture Content: IS 2720-2 1973 RA 2015
Test Method Variation :	None		

END OF TEST RESULTS

ANNEXURE IV

GRAIN SIZE ANALYSIS CURVES

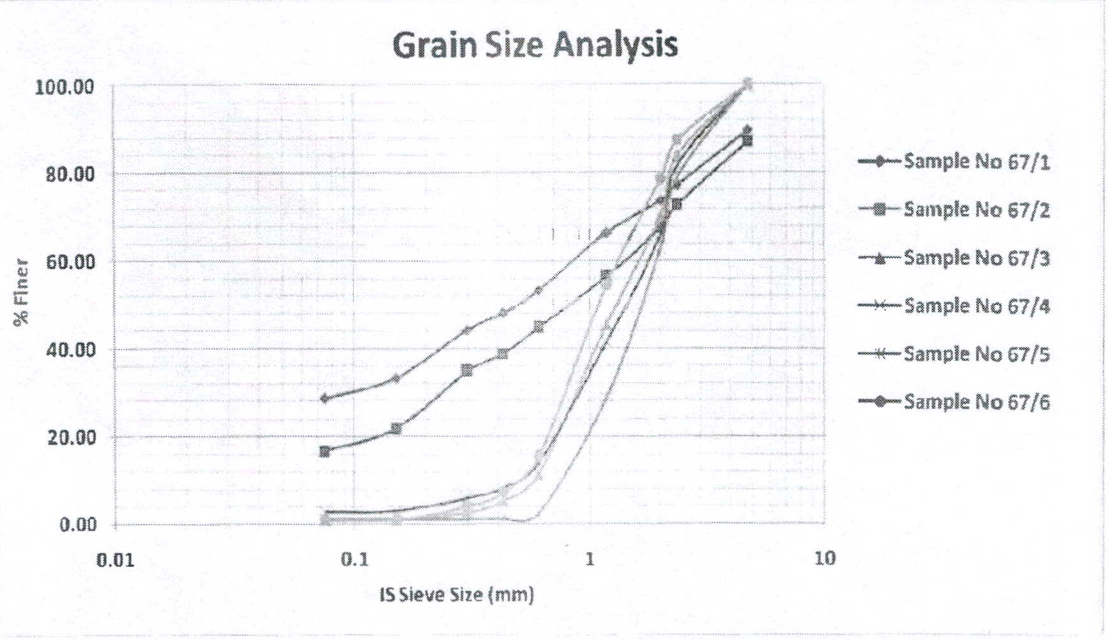

Fig. No. 1: Grain size analysis Curves around BH-1

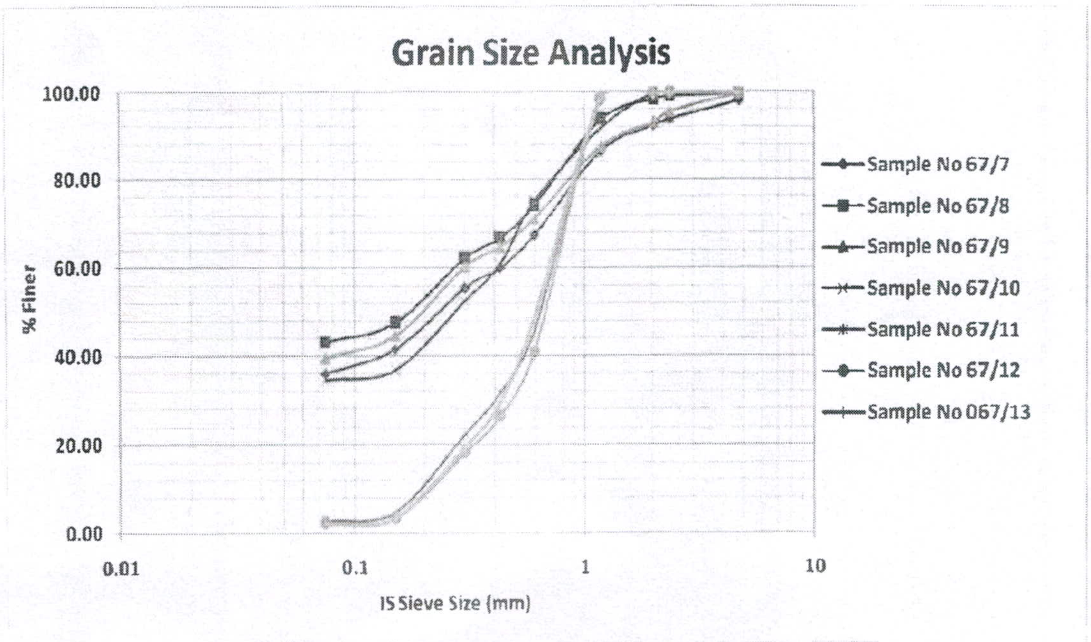

Fig. No. 2: Grain size analysis Curves around BH-2

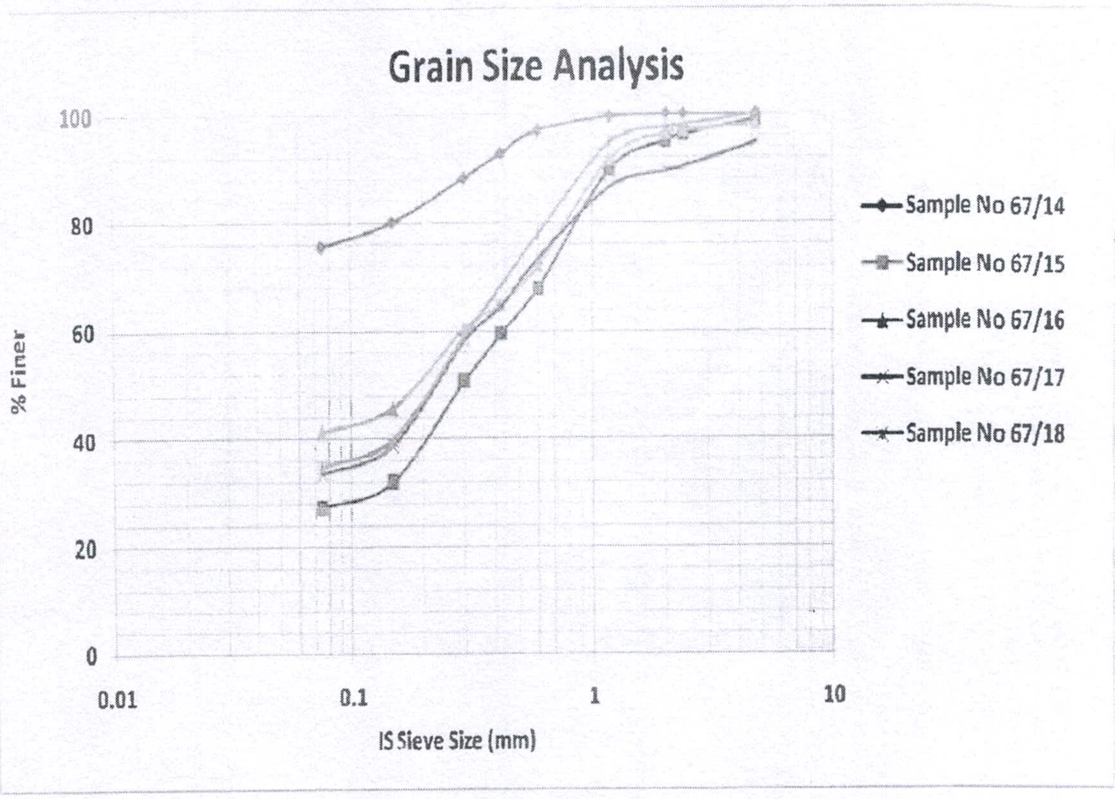

Fig. No. 3: Grain size analysis Curves around BH-3

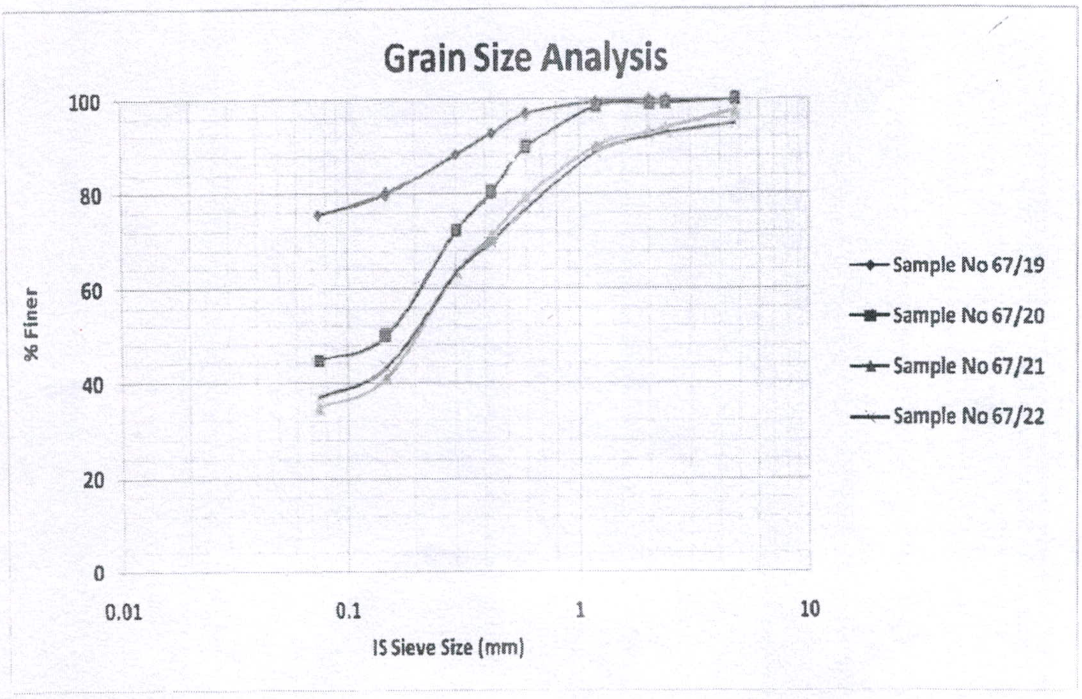

Fig. No.4: Grain size analysis Curves around BH-4

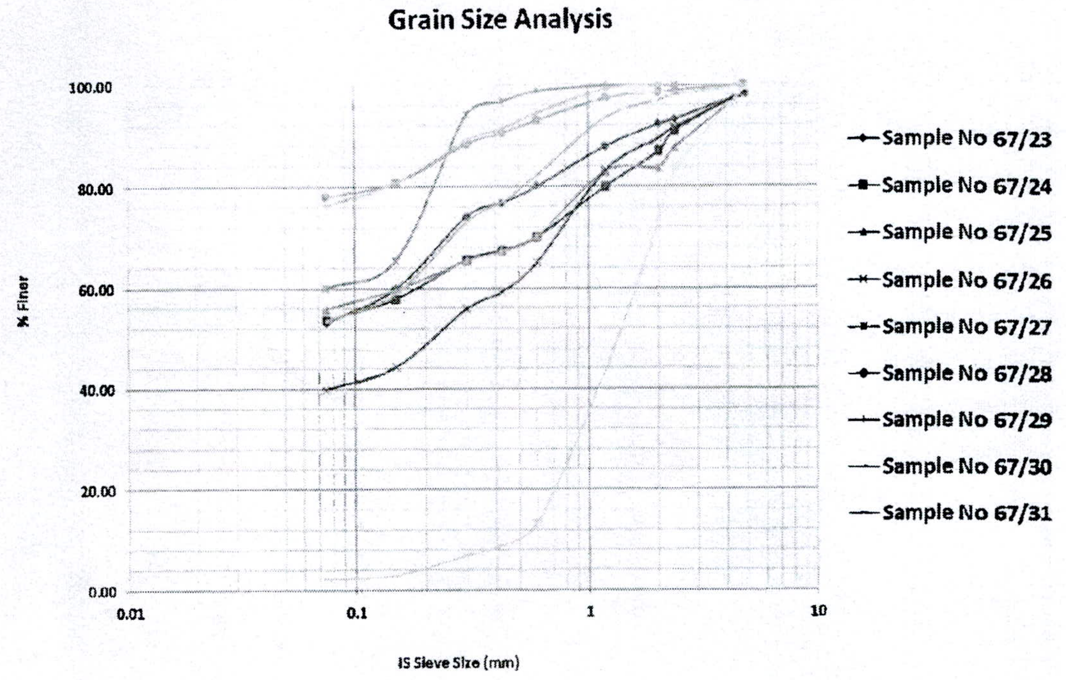

Fig. No. 5: Grain size analysis Curves around BH-5

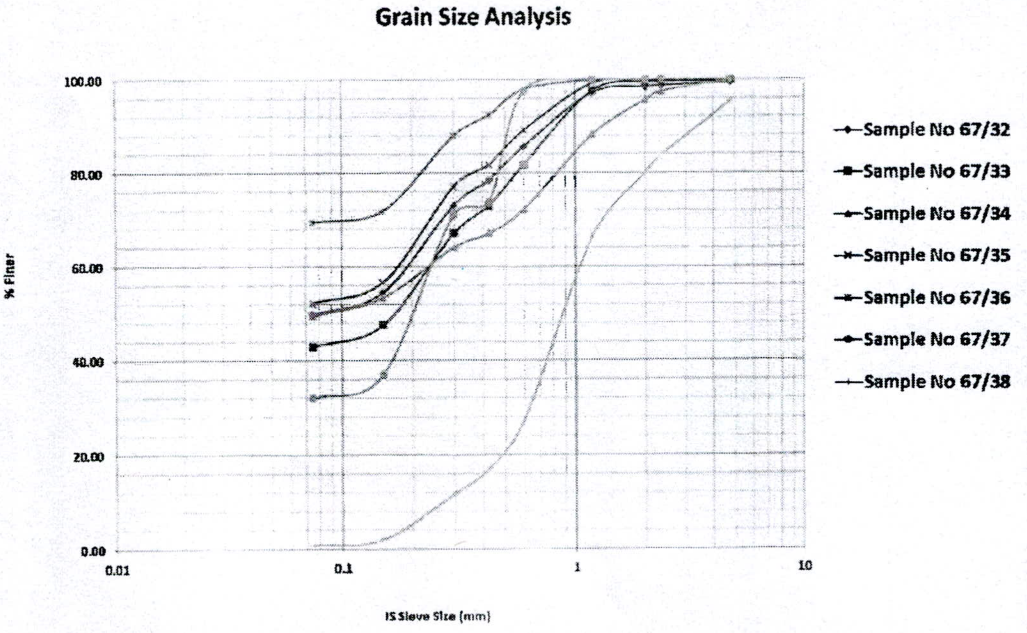

Fig. No. 6: Grain size analysis Curves around BH-6

*** END OF REPORT***

11 AUG 2020
12 29 PM

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150033-JP NAGAR OMU 1

ESTIMATE REPORT

Work Type: Regular

Est. Start Date:

Priority: 0

Required:

Task Status: PLANNING

Assigned To: NAMPRASAD_TR

Contractor:

Work Order *1485734*

Task *01*

Budget Head :

Execution Method: SELF EXECUTION

Task Desc.: Estimate for shifting & conversion of existing electrical utilities HT/LT, lines , DTC / RMU's poles from sarakki signal Junction to Puttenahally UNDERPASS , as per the Request of EXECUTIVE ENGINEER (planing Division -3_ BBMP Annexure -2 .A.N Road bangalore . in O&m-1 Unit ,s-6 subdivision.

Component ID:

Description:

Dept/Area: 150033-JP NAGAR OMU 1

Task Note Type	Notes
CERTIFICATE	Certified that I have inspected the spot and prepared this estimate by using current SR for the most economical and safest way of executing the work.
DESCRIPTION	This Estimate amounting to Rs. 3,49,71,555/-[Three Four, Nine Seven One Five Five Five]) for shifting & Conversion of existing Elctrical Utilities like poles,/ DTC's/ Lines(HT/LT), along side of the 15 Cross outer Ring road from SARAKKI SIGNAL JUNCTION TO PUTTENAHALLY UNDERPASS . in O&m-1 unit of S-6 subdivision. since the up coming fly over is coming through the outer ring road as per Irequest made by the EXECUTIVE ENGINEER (planning division-3) BBMP annexure building -2 A./N Road bangalore . Accordingly I have visited The spot & prepae the Route Sketch where ever our existing electrical utilities are to be shifted everything i have drawn in the detail in the sketch as shown, it is proposed to convert the 11 kv line , spun pole into 5 way RMU's & whereever LRC /LBS is there ,in that particlar place I have proposed two nos of 5 WAY RMU with DAS Specification. & aprt from that ihave proposed 5 way conventional RMU . to Achieve LOOP IN LOOP OUT system of the HT network . 4 nos OF DTC 's is to be shifted apart from exisring place to create easy path to the pedastriants ,& also it is proposed to Lay 3x400 sq mm XLPE HT UG cable for Trunk LINE . & 3x95 sqmm XLPE HT ug Cable for loop cable , & for LT it is proposed 16 nos 12 way Feeder Piller BOXES to make electrical connection to the Existing Consumer by providibg 3.5cX240 sq mm XLPE LT ug cable & By providing 4c x25 sqmm XLPE LT ug servicemain cable . All the ncesary Materials & Labour Charges are made provision in this Estimate to Carry out The work under SELF EXECUTION BASIS .Hence this detailed Estimate along with Sketch is submitting to your Kind self for necessary sanction.

Submitted by: NAMPRASAD_TR

11 AUG 2020
12:29 PM

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150033-JP NAGAR OMU 1

ESTIMATE REPORT

Task Note Type Notes

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	287207	Armoured L.T.UG Cable 1.1kV Class | 25 Sq.mm, 4 Core	138249	2.1	KM	290322.9	N
2	NDS	300312	LT Feeder Piller box 12 way with cutouts	48368	16	NO	773888	N
3	NDS	613050	Caution/Danger Board	146	10	NO	1460	N
4	NDS	287400	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-95 Sqmm	782621	2.2	KM	1721766.2	N
5	NDS	302494	RTU (Remote terminal unit) RTU have configuration and maintance software tool compaitable for exisring DAS system. input voltage : 16V DC to 32 V DC. Type : Isolated ungrounded type. Output voltage : 24 DC fixed. Output current :2.5 Amps fixed	333824	3	NO	1001472	N
6	NDS	302482	5 Way RMU, 2OD + 3VL (One Incomer + Three Breakers + One Outgoing) Conventional RMUs (VCB Type) with Copper Bus Bar, 350MVA, 630 Amps	1811864	6	NO	10871184	N
7	NDS	302492	5 Way RMU, 2OD + 3VL (One Incomer + Three Breakers + One Outgoing) with DAS Specification	948600	3	NO	2845800	N
8	NDS	800650	River sand	1700	4	CMT	6800	N
9	NDS	801034	Cable covering tiles 125x125x40 mm	5000	120	PK	600000	N
10	NDS	802460	Route & joint indicating stone with M. s Anchor rod	130	10	NO	1300	N
11	NDS	768052	GI Pipes B-Class | GI Pipe-100 mm dia	1242	40	MTR	49680	N
12	NDS	820672	RCC hume pipes 2000mm long 150mm dia	300	15	NO	4500	N
13	NDS	288304	Heat Shrinkable outdoor type	4715	15	SET	70725	N

			Thk , MS Stiffner plate 12 mm Thk,MS plate Base Plate 16 mm Thk, J Blots 12 mm dia, Gusset Plates, clamps,15mm rods 2.5m length as per drawing details Tor Steel Rods cut of Dia 8 mm,10mm,12mm,16 mm and 20 mm bent as per drawing & tied inclusive of labour for Reinforced foundation (Total 380 kgs)					
27	NDS	622720	Supply of PVC Insulation tape	14	100	ROLL	1400	N
28	NDS	358050	LT Metering Box for housing the ETV Meters without CT's busbar wiring etc.	3664	4	NO	14656	N
29	NDS	279800	MS Fish Plate	54	25	NO	1350	N
30	NDS	284503	LT Spacer for TC Wiring	41	24	NO	984	N
31	NDS	285565	P.G. Clamps Rabbit to Insulated wire | 240Sq mm	316	12	NO	3792	N
32	NDS	288536	Heavy duty Copper terminals long barrel | 240 Sq.mm Copper terminals	244	200	NO	48800	N
33	NDS	289036	PVC Insulated & Un-Sheathed Aluminium Wires, Single core multi strand 1.1 kV class |PVC Wire- 240 Sq.mm	198.54	1000	MTR	198540	N
34	NDS	301060	L.T.Distribution Box for 100 / 250 kVA DTC with MCCB's(SMC)	24559	5	NO	122795	N
35	NDS	607054	Grounding Materials for RMUs & Transformers | Good Quality Salt for grounding purposes packed in 50kg gunny bags	275	40	BG	11000	N
36	NDS	600095	Grounding Materials for RMUs & Transformers | Good Quality well burnt Charcoal for grounding purposes packed in non returnable gunny bags of 30kg each	600	40	NO	24000	N
37	NDS	281674	Grounding Materials for RMUs & Transformers | G.I.Grounding pipe, B-Class, 40 mm dia,2.5 mtrs long, 2.9mm thick with bolts nuts,GI Strips and washers	626	60	NO	37560	N

			cable termination kit for XLPE cable | 3X240 Sq.mm					
14	NDS	288324	Heat Shrinkable Straight through jointing kits for XLPE cable with Copper lugs & Al ferrules | 3X240 Sq.mm	7903	12	SET	94836	N
15	NDS	288305	Heat Shrinkable outdoor type cable termination kit for XLPE cable | 3x400 Sq.mm	4750	40	SET	190000	N
16	NDS	288329	Heat Shrinkable Straight through jointing kits for XLPE cable with Copper lugs & Al ferrules | 3x400 Sq.mm	9706	15	SET	145590	N
17	NDS	287405	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-240 Sqmm	1471370	2.2	KM	3237014	N
18	NDS	287410	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-400 Sqmm	2245566	1.8	KM	4042018.8	N
19	NDS	768058	GI Pipes B-Class | GI Pipe-150 mm diaA CI	1243	200	MTR	248600	N
20	NDS	281010	Supply of GI wire 10 Swg	66777	5	MT	33388.5	N
21	NDS	283008	11kV, 5KN Composite/Polymeric Pin Insulator(24mm dia FP Rod)	180	70	NO	12600	N
22	NDS	821900	Transparent Alkathine tube 19mm dia, 2mm thick in coils of 30 mtrs	458	30	COIL	13740	N
23	NDS	279131	Three H Frame without Transformer Seating and Seating angle support X arm for 11 mtr Spun Pole for 63/100/250/500kVA (UG Cable) - MS	16352	12	SET	196224	N
24	NDS	304212	11kV G.O.S 200A Single break	7799	20	SET	155980	N
25	NDS	200120	Pre-Stressed Tubular Spun Pole 11Mtrs Long	16850	5	NO	84250	N
26	NDS	280132	Prefabricated Platform for erection of 250kVA Transformer on 11 mtr Spun Pole Structure involving Rectangular hollow Sections 96x48x4.87Thk and 66x3x4.5Thk, Circular hollow section of 165.6 OD x 10	45600	4	SET	182400	N

complete

38	NDS	287216	Armoured L.T.UG Cable 1.1kV Class | 240 Sq.mm. 3.5 core	768443	3.5	KM	2689550.5	N

Sub Total : ******

LABOR

S.NO	Stock Code	Item Description	Rate	Qty Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	L11KV.14.13	Releasing of PSC/PSCC/PCC Pole as per direction of Engineer-in-charge of work	0	18	NO	0	N
2	-11KV.24.1.5	Making and Fixing of Heat shrinkable type pot head for 3x95 to 3x150 sq.mm HT UG Cable only	1709	15	NO	25635	N
3	L11KV.25.6	Refilling the RMU foundation with the approved new earth with initial lead of 50 mtr including watering and tamping layers of 15 cm thick etc., complete	76	45	CU	3420	N
4	-11KV.27.1.1	Boring & Drawing of UG cable including preparation at site by trenchless technology by adopting horizontal boring of 5" bore size in normal soil without HDPE Pipe	706	2150	RMTR	1517900	N
5	L11KV.22.7	UG Cable Work:Refilling the cable trenches with selected available earth from trench excavation including watering, consolidation in layers of 15 cm. Thickness including depositing of the surplus earth with a lead of 200 Mtrs.	50	30	CMT	1500	N
6	-11KV.22.1.1	UG Cable Work: Earth work excavation for cable trench of 0.5 to 0.75 mtr. Width and Depth upto 1 mtr. including trial pits, depositing on bank upto a lead of 50 mtrs, Supplying and Displaying necessary Danger Boards and Lighting, Using sight Rails and Sign Boards at every 100mtrs wherever necessary as directed in Ordinary Soil	226	40	CU	9040	N
7	-11KV.23.4.3	Heat shrinkable straight through joint for 3x300 to 3x400 sq.mm HT UG Cable	1865	15	NO	27975	N
8	-11KV.23.4.1	Heat shrinkable straight through joint for 3x95 to 3x150 sq.mm HT UG Cable	1865	12	NO	22380	N
9	-11KV.24.1.6	Making and Fixing of Heat shrinkable type pot head for 3x185 to 3x240sq.mm HT UG Cable only	1709	40	NO	68360	N
10	L11KV.13.5	Fixing of GOS including wiring (11kV SB 200A)	700	12	SET	8400	N
11	L11KV.6.1.7	Rates for LT Reconductoring Works Releasing of Rabbit conductor	2582	1.8	KMPV	4647.6	N
12	L11KV.6.1.6	Rates for LT Reconductoring Works Releasing of Weasel conductor	1894	1.2	KMPV	2272.8	N
13	L11KV.6.3	Erection of 200-250 kVA Transformer on Transformer	1502	4	EA	6008	N

ESTIMATE REPORT

		structure.					
14	L11KV.4	Construction of platform with size stone, cement concrete for erection of 500 kVA Transformer/Heavy Equipment.Construction of platform (1.5x1.5x1.2) mtr in size stone, for erection of transformers/Heavy equipment including all materials, labour. Excavation of (1.5x1.5x1) mt pit for foundation providing and laying cement concrete 1:4:8 for foundation laid in 1cm thick layers, well compacted curing etc., complete providing and construction of stone masonary 0.9m below ground level and 1.2m above ground level neatly hammer dressed in cement morter 1:6 cutting complete providing pointing to stone masonary in cement morter 1:3 after racking joint & nisely lining curing etc., plastering the concrete surfaces in cement morter 1.4 including smooth randering curing etc., curing at every stages completely.	26401	25	SC	660025	N
15	L11KV.2.1.9	Releasing and Replacing 11KV Pin Insulators	31	70	NO	2170	N
16	L11KV.14.16	Releasing & Re-Erection of 250kVA Distribution Transformer as per direction of Engineer-in-charge of work	0	4	NO	0	N
17	L11KV.14.22	Releasing of 4Pin Cross arm with clamps as per direction of Engineer-in-charge of work	0	18	NO	0	N
18	L11KV.14.14	Releasing of Spun pole DP structure (Above 250kVA DTC) complete including Pole as per direction of Engineer-in-charge of work	0	6	SET	0	N
19	L11KV.25.17	Lettering the RMU with enamel paint and also writing single line diagram of each panel, caution Board, Danger Board etc., including cost of Paint, Brush etc.,	656	40	PNL	26240	N
20	.11KV.23.2.3	Laying of 120 to 240 sq.mm LT UG cable in Existing trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff	20998	3.5	KM	73493	N
21	.11KV.23.2.1	Laying of 2.5 to 25 sq.mm LT UG cable in Existing trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff	14051	2.1	KM	29507.1	N
22	.11KV.23.1.1	Laying of 3x95 to 150 sq.mm HT UG cable in Existing trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff	39377	2.2	KM	86629.4	N

11 AUG 2020
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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150033-JP NAGAR OMU 1

ESTIMATE REPORT

Sub Total : ******

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)
S_CONTING	Contingency Charges	667523.49
S_EMPLOYEE	Employee Cost	667857.45
S_LOCALITY	Locality Allowance @ ¿ % on Labour charges (applicable for areas mentioned in Dept)	770604.75
ELE INSPEC		10000
OTHERS	Other Misc Charges	250000

Sub Total : 2365985.691

Total : 34971555.491
(Material+Labor+Other)

ATTACHMENTS:

PERMITS:

Type	Number	Acquired Date

Requestor Name:

Date

COMPLETION COMMENTS:

Start Date: ____________ Time: ____________ Completion Date: ____________ Time: ____________

SUMMARY

TASK NO	MATERIAL	LABOR	OTHER REQT	TOTAL
01	30029966.9	2575602.9	2365985.691	34971555.491
OVERALL TOTAL	30029966.9	2575602.9	2365985.691	34971555.491

Submitted by: NAMPRASAD_TR

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.
ಜೆ.ಪಿ. ನಗರ,-ಬೆಂಗಳೂರು – 560 078.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಕಾ ಮತ್ತು ಪಾ ಘಟಕ-1, ಜೆ.ಪಿ. ನಗರ
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.

07 AUG 2020
01 48 PM

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150033-JP NAGAR OMU 1

ESTIMATE REPORT

Work Type: Regular

Est. Start Date:

Priority: 0

Required:

Task Status: PLANNING

Assigned To: NAMPRASAD_TR

Contractor:

Work Order *1487317*

Task *01*

Budget Head :

Execution Method: DEPARTMENTAL

Task Desc.: CREDIT ESTIMATE of shifting & conversion of electrical utilities from sarakki signal junction to puttenahally underpass , in u-1 ,s-6 subdivision. JP Nagar bengalore - 560078

Component ID:

Description:

Dept/Area: 150033-JP NAGAR OMU 1

Task Note Type	Notes
CERTIFICATE	Certified that I have inspected the spot and prepared this estimate by using current SR for the most economical and safest way of executing the work. under SELF EXECUTION BASIS
DESCRIPTION	This CREDIT ESTIMATE hsa been prepared to Return all the released materials after shiftinfg & conversion of Electrical Lines HT/LT , Poles Sketon , X arms ,releasd DP structures materials , released ACSR Conductor , released Aluminium Lead wire , all the above released materials will be returned as Scrap to the respective JAYANAGAR Divisional Store

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	U12	791531	SCRAP MATERIALS | Alumininium LEAD WIRE	71	-30	KG	-2130	Y
2	U12	791300	SCRAP MATERIALS | Iron Items , DP STRUCTURE	195	-124	KG	-24180	Y
3	U12	790104	SCRAP MATERIALS | Iron Items | Cross arms, clamps etc.	27	-75	KG	-2025	Y
4	U12	791101	SCRAP MATERIALS | ACSR conductor	111	-948	KG	-105228	Y
5	U12	790401	SCRAP MATERIALS | Iron Items | Scrap GOS with insulators	25	-250	KG	-6250	Y
6	U12	790103	SCRAP MATERIALS | Iron Items | Released steel from	20	-120	KG	-2400	Y

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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150033-JP NAGAR OMU 1

ESTIMATE REPORT

RCC Poles (Skeleton Rods)

Sub Total : -142213

LABOR

S NO	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)

Sub Total :

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)

Sub Total :

Total : -142213
(Material+Labor+Other)

ATTACHMENTS:

PERMITS:

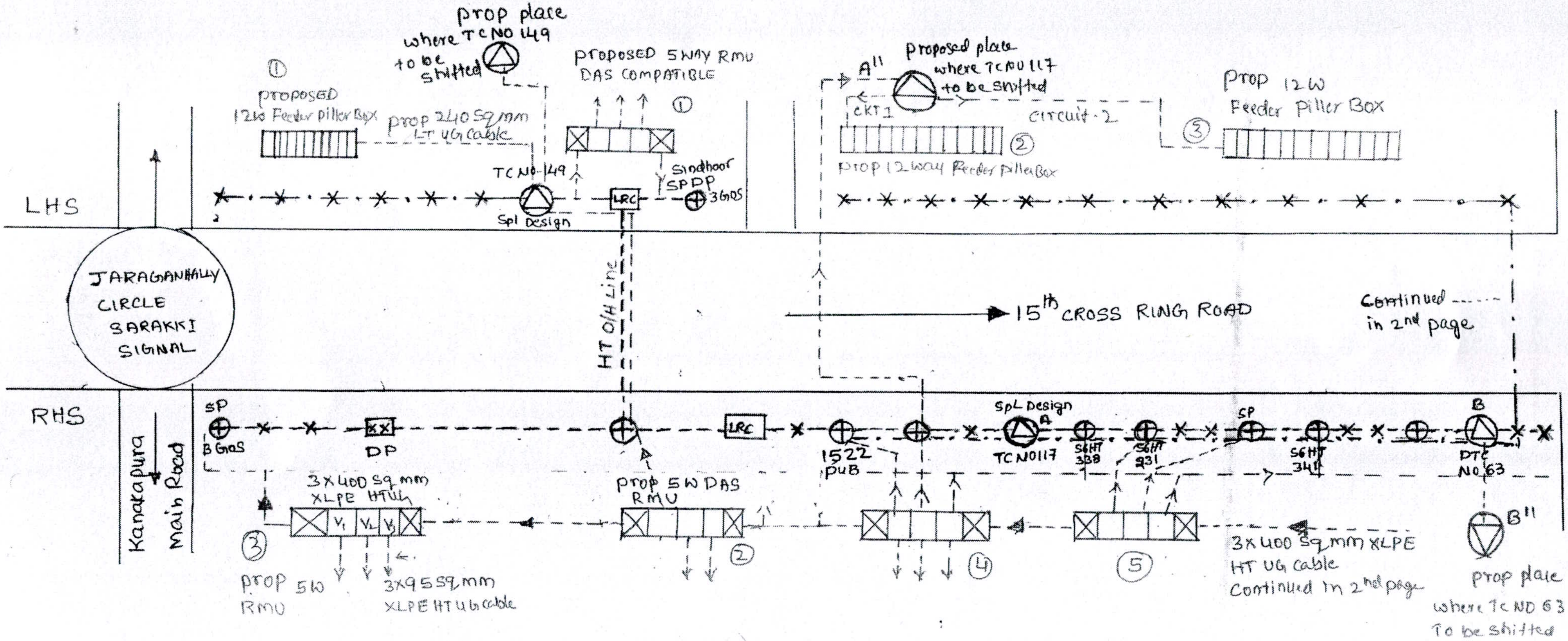
Type	Number	Acquired Date

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.
ಜೆ.ಪಿ. ನಗರ, ಬೆಂಗಳೂರು – 560 078.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಕಾ ಮತ್ತು ಪಾ ಘಟಕ-1, ಜೆ.ಪಿ. ನಗ
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.

bmitted by NAMPRASAD_TR

Sketch Showing for Shifting of Electricals Utlities Across the Uploming Flyover From Sarakki Signal Junction to 24th main Road Underpass. in O&M-1 Jurisdiction OF S6 Subdivision, BESCOM, J.P.NAGAR, BENGALURU-560078

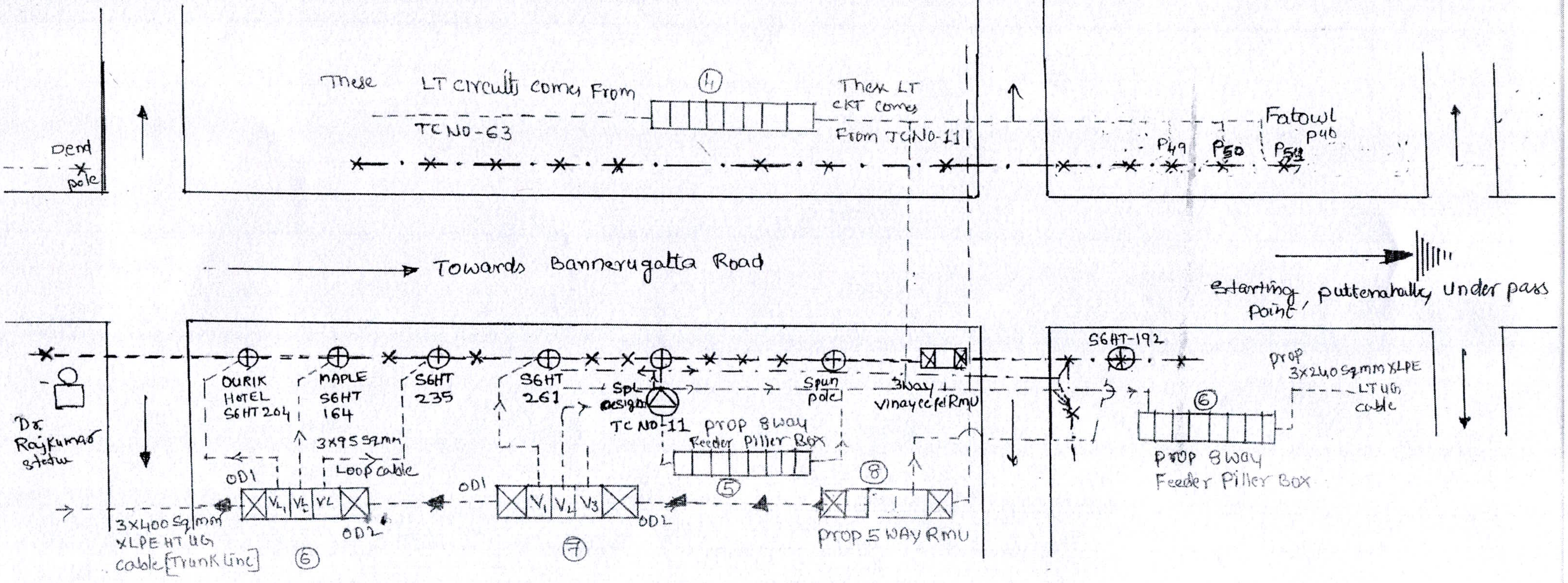

prop place where TC NO 149 to be shifted
① proposed 12w Feeder piller Box
prop 240 sq mm LT UG cable
proposed 5WAY RMU DAS COMPATIBLE
①
TC NO-149
Spl Design
LRC
Sindhoor SPDP
3GOS
LHS
A''
proposed place where TC NO 117 to be shifted
CKT 1
circuit-2
prop 12 way Feeder piller Box
②
Prop 12W Feeder Piller Box
③
JARAGANHALLY CIRCLE SARAKKI SIGNAL
HT O/H Line
15th CROSS RING ROAD
Continued in 2nd page
RHS
Kanakapura Main Road
SP
B GOS
DP
3x400 sq mm XLPE HTUG
V1
V2
V3
③
prop 5W RMU
3x95 sq mm XLPE HT UG cable
prop 5W DAS RMU
②
LRC
1522 PUB
SpL Design
A
TC NO117
S6HT 338
S6HT 231
SP
S6HT 341
B
DTC NO 63
④
⑤
3x400 sq mm XLPE HT UG cable Continued in 2nd page
B''
Prop place where TC NO 63 To be shifted

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.
ಜೆ.ಪಿ. ನಗರ, ಬೆಂಗಳೂರು - 560 078.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಕಾ ಮತ್ತು ಪಾ ಘಟಕ-1, ಜೆ.ಪಿ. ನಗರ
ಎಸ್-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.

INDEX

·	Existing 5 N LT O/H Line on 9mtr Support
--	Existing 11KV O/H Line on 9mtr Support
⊕	Existing 11 mtr Spun pole to be Released
- - - -	proposed 5C×240 Sq mm XLPE LT UG Cable
▥	proposed LT Feeder Piller Box
- - - -	prop 3×95 and 3×400 Sq mm XLPE HT UG Cable
☒☐☐☒	prop 5 WAY DAS & NON DAS RMU's
⊳	Existing Transformer Centre which is to be shifted to New place.


These LT circuits comes From TC NO-63
④
Thes LT CKT Comes From TC NO-11
Fatowl
P49
P50
P51
P40
Dend pole
Towards Bannerugatta Road
Starting Point, puttenahalli Under pass
Dr. Rajkumar statue
OURIK HOTEL S6HT 204
MAPLE S6HT 164
S6HT 235
S6HT 261
Spl design
TC NO-11
Spun pole
3 Way Vinayaka RMU
S6HT-192
prop 3×240 Sq mm XLPE LT UG cable
⑥
prop 8 way Feeder Piller Box
prop 8 Way Feeder Piller Box
⑤
3×95 Sq mm Loop cable
OD1
OD2
V1
V2
V3
VL
⑥
⑦
⑧
Prop 5 WAY RMU
3×400 Sq mm XLPE HT UG cable [Trunk Line]

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಎಸ್‌-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.
ಜೆ.ಪಿ. ನಗರ, ಬೆಂಗಳೂರು – 560 078.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್ (ವಿ)
ಕಾ ಮತ್ತು ಪಾ ಘಟಕ-1, ಜೆ.ಪಿ. ನಗರ
ಎಸ್‌-6, ಉಪ ವಿಭಾಗ, ಬೆ.ವಿ.ಕಂ.

10 AUG 2020
07:52 PM

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Work Type: Regular Est. Start Date:	Priority: 0 Required: Task Status: PLANNING Assigned To: RAJESH04 Contractor :	Work Order *1488792* Task *01*

Budget Head :

Execution Method: SELF EXECUTION

Task Desc.: Estimate for shifting and conversion of existing electrical lines/DT's/RMU's/poles from GSI ORR junction to Sarakki signal along ORR as per the request of Executive Engineer(Planning Division -3) BBMP Annexure building-2, A.N Road Bengaluru in O&M-1, S5 Sub-Division, ISRO Layout, Bengaluru under self execution.

Component ID: Description:

Dept/Area: 150031-ISRO LAYOUT OMU

Task Note Type	Notes

COMPATIBLE UNITS:

Capital

INSTALL

Compatible Unit	Description	Qty	UOM	Difficulty
000000000000135	Laying of 11KV 3 core 240 Sq. MM XLPE cable Using Horizontal Drilling	38	SPAN	NORMAL
000000000000138	Erection of Pre - Stressed Tubular Spun Pole 11 Mtr Long -500 Kg WL	10	NO	NORMAL

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	288322	Heat Shrinkable Straight through jointing kits for XLPE cable with Copper lugs & Al ferrules | 3X95 Sq.mm	6481	6	SET	38886	N
2	NDS	287400	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-95 Sqmm	782621	1.1	KM	860883.1	N
3	NDS	280612	GI Bolts & Nuts of Size 16x40mm	112735	.4	MT	45094	N
4	NDS	281674	Grounding Materials for RMUs & Transformers | G.I.Grounding pipe, B-Class, 40 mm dia,2.5 mtrs long, 2.9mm thick with bolts nuts,GI Strips and washers complete	626	12	NO	7512	N
5	NDS	279020	11kV Horizontal X arm	251	40	NO	10040	N
6	NDS	802460	Route & joint indicating stone with M. s Anchor rod	130	28	NO	3640	N

Submitted by: RAJESH04

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S-5, [illegible] BESCOM
[illegible] 078.

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

7	NDS	800650	River sand	1700	24	CMT	40800	N
8	NDS	801034	Cable covering tiles 125x125x40 mm	5000	120	PK	600000	N
9	NDS	768052	GI Pipes B-Class | GI Pipe-100 mm dia	1242	80	MTR	99360	N
10	NDS	820672	RCC hume pipes 2000mm long 150mm dia	300	45	NO	13500	N
11	NDS	288304	Heat Shrinkable outdoor type cable termination kit for XLPE cable | 3X240 Sq.mm	4715	32	SET	150880	N
12	NDS	288324	Heat Shrinkable Straight through jointing kits for XLPE cable with Copper lugs & Al ferrules | 3X240 Sq.mm	7903	32	SET	252896	N
13	NDS	288305	Heat Shrinkable outdoor type cable termination kit for XLPE cable | 3x400 Sq.mm	4750	32	SET	152000	N
14	NDS	288329	Heat Shrinkable Straight through jointing kits for XLPE cable with Copper lugs & Al ferrules | 3x400 Sq.mm	9706	21	SET	203826	N
15	NDS	287410	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-400 Sqmm	2245566	2.4	KM	5389358.4	N
16	NDS	768058	GI Pipes B-Class | GI Pipe-150 mm diaA CI	1243	210	MTR	261030	N
17	NDS	281010	Supply of GI wire 10 Swg	66777	2	MT	13355.4	N
18	NDS	283008	11kV, 5KN Composite/Polymeric Pin Insulator(24mm dia FP Rod)	180	120	NO	21600	N
19	NDS	821900	Transparent Alkathine tube 19mm dia, 2mm thick in coils of 30 mtrs	458	36	COIL	16488	N
20	NDS	280130	Three H Frame without Transformer Seating and Seating angle support X arm for 11 mtr Spun Pole for 63/100/250/500kVA (UG Cable) - GI	18477	16	SET	295632	N
21	NDS	304212	11kV G.O.S 200A Single break	7799	36	SET	280764	N
22	NDS	304224	11kV G.O.S 400A Double break	17545	4	SET	70180	N

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WORK ORDER REPORT

23	NDS	287405	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-240 Sqmm	1471370	3.45	KM	5076226.5	N
24	NDS	200120	Pre-Stressed Tubular Spun Pole 11Mtrs Long	16850	12	NO	202200	N

Sub Total : *******

LABOR

S.NO	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	L11KV.23.4.1	Heat shrinkable straight through joint for 3x95 to 3x150 sq.mm HT UG Cable	1865	6	NO	11190	N
2	L11KV.24.1.5	Making and Fixing of Heat shrinkable type pot head for 3x95 to 3x150 sq.mm HT UG Cable only	1709	12	NO	20508	N
3	L11KV.2.12	Fixing of H Frame.	210	12	NO	2520	N
4	L11KV.24.1.6	Making and Fixing of Heat shrinkable type pot head for 3x185 to 3x240sq.mm HT UG Cable only	1709	32	NO	54688	N
5	L11KV.24.1.7	Making and Fixing of Heat shrinkable type pot head for 3x300 to 3x400 sq.mm HT UG Cable only	1709	32	NO	54688	N
6	L11KV.23.4.2	Heat shrinkable straight through joint for 3x185 to 3x240 sq.mm HT UG Cable	1865	32	NO	59680	N
7	L11KV.23.4.3	Heat shrinkable straight through joint for 3x300 to 3x400 sq.mm HT UG Cable	1865	21	NO	39165	N
8	L11KV.22.8.1	Covering cable with Tiles for UG cable works.	2863	.68	KM	1946.84	N
9	L11KV.22.8.1	Spreading and forming with sand all round the cable to a depth of 75 mm and width of 500 mm for UG cable works(sand charges are separate).	10061	680	RMTR	6841480	N
10	L11KV.22.8.1	Fixing of Route Joint indicating Slabs for UG cable works.	75	28	NO	2100	N
11	L11KV.13.5.2	Fixing of 11KV 400A DB GOS including wiring	777	4	SET	3108	N
12	L11KV.13.5	Fixing of GOS including wiring (11kV SB 200A)	700	36	SET	25200	N
13	L11KV.1.8.2.	Providing cement conccrete to 11 mtrs Spun Pole (1000x1000x2500mm) with CC 1:2:4 (without coping) [includes material and labour including necessary curing etc. (cost does not include excavation)]	12177	12	EACH	146124	N
14	L11KV.1.8.3.	providing coping for pole with CC 1:2:4 (As per actuals)390mm all around the pole for an height of 300mm for Spun poles	1930	12	EA	23160	N
15	L11KV.1.8.1.	Providing cement conccrete to Pole base 11mtr spun pole (1000x1000x150mm) with CC 1:4: 8 [includes material and labour including necessary curing etc. (cost does not include excavation)]	730	12	EA	8760	N

Submitted by: RAJESH04

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ISRO LAYOUT, BANGALORE-560 078.

WORK ORDER REPORT

16	11KV.27.1.	Spun Pole Painting (supplying & applying two coats of enamel paints to 11Mtrs spun pole) and painting	2959	12	POLE	35508	N
17	L11KV.2.7	Erection of 11mtr long Concrete spun pole in a pit of 2.5 mtr depth, aligning refilling with soil and ramming	1216	10	NO	12160	N
18	L11KV.1.5.1	Digging of Pit 2.5 mtr depth for errection of 11mtr long tubular spun pole as per approved drawing in Ordinary Soil	1251	10	PI	12510	N

Sub Total : ******

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)
S_CONTING	Contingency Charges	473339.92
S_EMPLOYEE	Employee Cost	1912168.9
S_LOCALITY	Locality Allowance @ ¿.% on Labour charges (applicable for areas mentioned in Dept)	2206348.8

Sub Total : 4591857.5902

ATTACHMENTS:

PERMITS:

Type	Number	Acquired Date

Requestor Name:

Date:

COMPLETION COMMENTS:

Start Date: ____________ Time: ____________ Completion Date: ____________ Time: ____________

FAILURE CODES:

Failure: ____________ Repair: ____________ Component: ____________

Follow-up Action Required:

Submitted by: RAJESH04

RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
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Bangalore

ASSISTANT EXECUTIVE ENGINEER (Ele.)
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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Work Type: Regular

Est. Start Date:

Priority 0
Required:
Task Status: PLANNING
Assigned To: RAJESH04
Contractor:

Work Order *1488792*

Task *02*

Budget Head :

Execution Method: SELF EXECUTION

Task Desc.: PROVIDING DAS COMPATIBLE RMU'S

Component ID: Description:

Dept/Area: 150031-ISRO LAYOUT OMU

Task Note Type Notes

COMPATIBLE UNITS:

Capital

INSTALL

Compatible Unit	Description	Qty	UOM	Difficulty
000000000000123	Erection of 4 Way Conventional RMU, 2OD + 2VL (One Incomer + Two I	2	SET	NORMAL
000000000000121	Erection of 5 Way Conventional RMU, 2OD + 3VL (One Incomer + Three	1	SET	NORMAL

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	281685	Rod type of earthing using 40 mm dia, 3 mtr long MS rod as ground rod, in earth pit of 300 mm width and 3300mm depth and using 50x6mm flat welded to ground rod as terminal & connected to equipment ground terminal using pvc Al wire as specified	1832	12	NO	21984	N
2	NDS	302481	4 Way RMU, 2OD + 2VL (One Incomer + Two Breakers + One Outgoing) Conventional RMUs (VCB Type) with Copper Bus Bar, 350MVA, 630 Amps	1451508	2	SET	2903016	N
3	NDS	302482	5 Way RMU, 2OD + 3VL (One Incomer + Three Breakers + One Outgoing) Conventional RMUs (VCB Type) with Copper Bus Bar, 350MVA, 630 Amps	1811864	1	NO	1811864	N

Sub Total : 4736864

LABOR

S.NO	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)

Submitted by: RAJESH04

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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

1	L11KV.22.7	UG Cable Work:Refilling the cable trenches with selected available earth from trench excavation including watering, consolidation in layers of 15 cm. Thickness including depositing of the surplus earth with a lead of 200 Mtrs.	50	18	CMT	900	N
2	L11KV.25.1	Earth Excavation for R.M.U. Foundation,depositing of earth on Bank up to a lead of 50 mtr and with a lift up to 1.5 mtr in Ordinary Soil	189	18	CU	3402	N
3	L11KV.4	Construction of platform with size stone, cement concrete for erection of 500 kVA Transformer/Heavy Equipment.Construction of platform (1.5x1.5x1.2) mtr in size stone, for erection of transformers/Heavy equipment including all materials, labour. Excavation of (1.5x1.5x1) mt pit for foundation providing and laying cement concrete 1:4:8 for foundation laid in 1cm thick layers, well compacted curing etc., complete providing and construction of stone masonary 0.9m below ground level and 1.2m above ground level neatly hammer dressed in cement morter 1:6 cutting complete providing pointing to stone masonary in cement morter 1:3 after racking joint & nisely lining curing etc., plastering the concrete surfaces in cement morter 1:4 including smooth randering curing etc., curing at every stages completely.	26401	4	SC	105604	N
4	L11KV.25.17	Lettering the RMU with enamel paint and also writing single line diagram of each panel, caution Board, Danger Board etc., including cost of Paint, Brush etc.,	656	14	PNL	9184	N
5	L11KV.25.16	Fixing foundation frame of channels and angle iron welding fixing in concrete aligning the 5 panels RMU on foundation bed, assembly of units, connecting Bus Bars from panel to panel initial filling of oil etc., complete	15602	3	NO	46806	N

Sub Total : 165896

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)
S_CONTING	Contingency Charges	99050.576
S_EMPLOYEE	Employee Cost	43132.96
S_LOCALITY	Locality Allowance @ ¿.% on Labour charges (applicable for areas mentioned in Dept)	49768.8

Sub Total : 191952.336

Submitted by: RAJESH04

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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Work Type: Regular
Est. Start Date:

Priority: 0
Required:
Task Status: PLANNING
Assigned To: RAJESH04
Contractor :

Work Order *1488792*

Task *02*

Budget Head :
Execution Method: SELF EXECUTION
Task Desc.: PROVIDING DAS COMPATIBLE RMU'S
Component ID: Description:
Dept/Area: 150031-ISRO LAYOUT OMU
Task Note Type Notes

COMPATIBLE UNITS:

Capital

INSTALL

Compatible Unit	Description	Qty	UOM	Difficulty
000000000000123	Erection of 4 Way Conventional RMU, 2OD + 2VL (One Incomer + Two I	2	SET	NORMAL
000000000000121	Erection of 5 Way Conventional RMU, 2OD + 3VL (One Incomer + Three	1	SET	NORMAL

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	281685	Rod type of earthing using 40 mm dia, 3 mtr long MS rod as ground rod, in earth pit of 300 mm width and 3300mm depth and using 50x6mm flat welded to ground rod as terminal & connected to equipment ground terminal using pvc Al wire as specified	1832	12	NO	21984	N
2	NDS	302481	4 Way RMU, 2OD + 2VL (One Incomer + Two Breakers + One Outgoing) Conventional RMUs (VCB Type) with Copper Bus Bar, 350MVA, 630 Amps	1451508	2	SET	2903016	N
3	NDS	302482	5 Way RMU, 2OD + 3VL (One Incomer + Three Breakers + One Outgoing) Conventional RMUs (VCB Type) with Copper Bus Bar, 350MVA, 630 Amps	1811864	1	NO	1811864	N

Sub Total : 4736864

LABOR

S.NO	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)

Submitted by: RAJESH04

RAJESH .N.M.
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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

ATTACHMENTS:

PERMITS:

Type	Number	Acquired Date

Requestor Name:

Date:

COMPLETION COMMENTS:

Start Date: Time: Completion Date: Time:

FAILURE CODES:

Failure: Repair: Component

Follow-up Action Required:

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BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Work Type: Regular
Est. Start Date:

Priority: 0
Required:
Task Status: PLANNING
Assigned To: RAJESH04
Contractor :

Work Order *1488792*

Task *03*

Budget Head :
Execution Method: SELF EXECUTION
Task Desc.: SHIFTING OF TRANSFORMERS

Component ID: Description:
Dept/Area: 150031-ISRO LAYOUT OMU

Task Note Type	Notes
CERTIFICATE	Certified that I have inspected the spot and prepared this estimate by using current SR for the most economical and safest way of executing the work.
FIELD VISIT	This estimate is prepared for shifting & conversion of existing electrical lines/DTC's/RMU's/Poles from GSI ORR junction to Sarakki Signal along ORR as per the request of Executive Engineer(Planning Division-3) BBMP Annexure building-2, A.N.Road Bangalorein O&M unit-1, ISRO Layout, S-5 sub-division, Bangalore-78. under self execution All the necessory materials and labour charges is made provision in this estimate Hence request your kind self to sanction this estimate at an early date to execute the work under self execution

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	287216	Armoured L.T.UG Cable 1.1kV Class | 240 Sq.mm, 3.5 core	768443	2.2	KM	1690574.6	N
2	NDS	287207	Armoured L.T.UG Cable 1.1kV Class | 25 Sq.mm, 4 Core	138249	1.9	KM	262673.1	N
3	NDS	300312	LT Feeder Piller box 12 way with cutouts	48368	12	NO	580416	N
4	NDS	613050	Caution/Danger Board	146	16	NO	2336	N
5	NDS	287400	11kV, 3 Core, XLPE HTUG Cable (ROUND Armoured)-95 Sqmm	782621	.5	KM	391310.5	N
6	NDS	622720	Supply of PVC Insulation tape	14	200	ROLL	2800	N
7	NDS	288531	Heavy duty Copper terminals long barrel | 95 Sq.mm Copper terminals	88	120	NO	10560	N
8	NDS	358050	LT Metering Box for housing the ETV Meters without CT's busbar wiring etc;	3664	8	NO	29312	N

Submitted by: RAJESH04

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S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078.

9	NDS	279800	MS Fish Plate	54	88	NO	4752	N
10	NDS	284503	LT Spacer for TC Wiring	41	124	NO	5084	N
11	NDS	285565	P.G. Clamps Rabbit to Insulated wire | 240Sq.mm	316	24	NO	7584	N
12	NDS	288536	Heavy duty Copper terminals long barrel | 240 Sq.mm Copper terminals	244	324	NO	79056	N
13	NDS	289036	PVC Insulated & Un-Sheathed Aluminium Wires, Single core multi strand 1.1 kV class |PVC Wire- 240 Sq.mm	198.54	400	MTR	79416	N
14	NDS	301060	L.T.Distribution Box for 100 / 250 kVA DTC with MCCB's(SMC)	24559	8	NO	196472	N
15	NDS	427215	Telescopic Earthing Rods	1528	24	NO	36672	N
16	NDS	607054	Grounding Materials for RMUs & Transformers | Good Quality Salt for grounding purposes packed in 50kg gunny bags	275	72	BG	19800	N
17	NDS	600095	Grounding Materials for RMUs & Transformers | Good Quality well burnt Charcoal for grounding purposes packed in non returnable gunny bags of 30kg each	600	72	NO	43200	N

Sub Total : 3442018

LABOR

S.NO	Stock Code	Item Description	Rate	Qty.Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	11KV.23.2.3	Laying of 120 to 240 sq.mm LT UG cable in Existing trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff	20998	2.2	KM	46195.6	N
2	11KV.22.1.1	UG Cable Work: Earth work excavation for cable trench of 0.5 to 0.75 mtr. Width and Depth upto 1 mtr. including trial pits, depositing on bank upto a lead of 50 mtrs, Supplying and Displaying necessary Danger Boards and Lighting, Using sight Rails and Sign Boards at every 100mtrs wherever necessary as directed in Ordinary Soil	226	1320	CU	298320	N
3	L11KV.6.3	Erection of 200-250 kVA Transformer on Transformer structure.	1502	6	EA	9012	N

Submitted by: RAJESH04

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S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078.

WORK ORDER REPORT

4	L11KV.4	Construction of platform with size stone, cement concrete for erection of 500 kVA Transformer/Heavy Equipment.Construction of platform (1.5x1.5x1.2) mtr in size stone, for erection of transformers/Heavy equipment including all materials, labour. Excavation of (1.5x1.5x1) mt pit for foundation providing and laying cement concrete 1:4:8 for foundation laid in 1cm thick layers, well compacted curing etc., complete providing and construction of stone masonary 0.9m below ground level and 1.2m above ground level neatly hammer dressed in cement morter 1:6 cutting complete providing pointing to stone masonary in cement morter 1:3 after racking joint & nisely lining curing etc., plastering the concrete surfaces in cement morter 1:4 including smooth randering curing etc., curing at every stages completely.	26401	8	SC	211208	N
5	L11KV.10.2	Releasing & Fixing Metering Box for housing the ETV Meter 3-ph 4 wire along with CT's, Meter & wiring for 100 kVA TC(1.9*8)	1260	15.2	SET	19152	N
6	L11KV.10.3	Releasing and Fixing Metering Box for housing the ETV Meter 3-ph 4 wire along with CT's, Meter & wiring for 250 kVA TC(1.9*8)	1260	15.2	SET	19152	N
7	L11KV.8.1	Fixing LT Distribution box for 100/ 250 / 500 KVA DTCs (Excluding wiring)	501	8	BX	4008	N
8	L11KV.13.20	Wiring of Two circuits of LT Wiring Kit for for 25/63/100 KVA DTC to the existing LT protection Kit / Distribution Box via metering box.	1001	8	NO	8008	N
9	L11KV.6.5	Providing GI Pipe Earthing for lightning arresters, Transformer Neutral / Transformer Metal parts (Excluding digging of pits)	128	24	SET	3072	N
10	L11KV.25.6	Refilling the RMU foundation with the approved new earth with initial lead of 50 mtr including watering and tamping layers of 15 cm thick etc., complete.	76	1320	CU	100320	N

Sub Total : 718448

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)
S_CONTING	Contingency Charges	87520.002
S_EMPLOYEE	Employee Cost	186796.38
S_LOCALITY	Locality Allowance @ ¿.% on Labour charges (applicable for areas mentioned in Dept)	215534.28
ELE INSPEC		50000
OTHERS	Other Misc Charges	100000

RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
S-5 Sub Division BESCOM,
Bangalore

ASSISTANT EXECUTIVE ENGINEER(Ele.)
S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078.

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Sub Total : 639850.6576

ATTACHMENTS:

PERMITS:

Type	Number	Acquired Date

Requestor Name: Date:

COMPLETION COMMENTS:

Start Date: ____________ Time: ____________ Completion Date: ____________ Time ____________

FAILURE CODES:

Failure: ____________ Repair: ____________ Component: ____________

Follow-up Action Required:

SUMMARY

TASK NO	MATERIAL	LABOR	OTHER REQT	TOTAL
01	14106151.4	7354495.84	4591857.5902	26052504.8302
02	4736864	165896	191952.336	5094712.336
03	3442018.2	718447.6	639850.6576	4800316.4576
OVERALL TOTAL	22285033.6	8238839.44	5423660.5838	35947533.624

Submitted by: RAJESH04

Rajesh N M

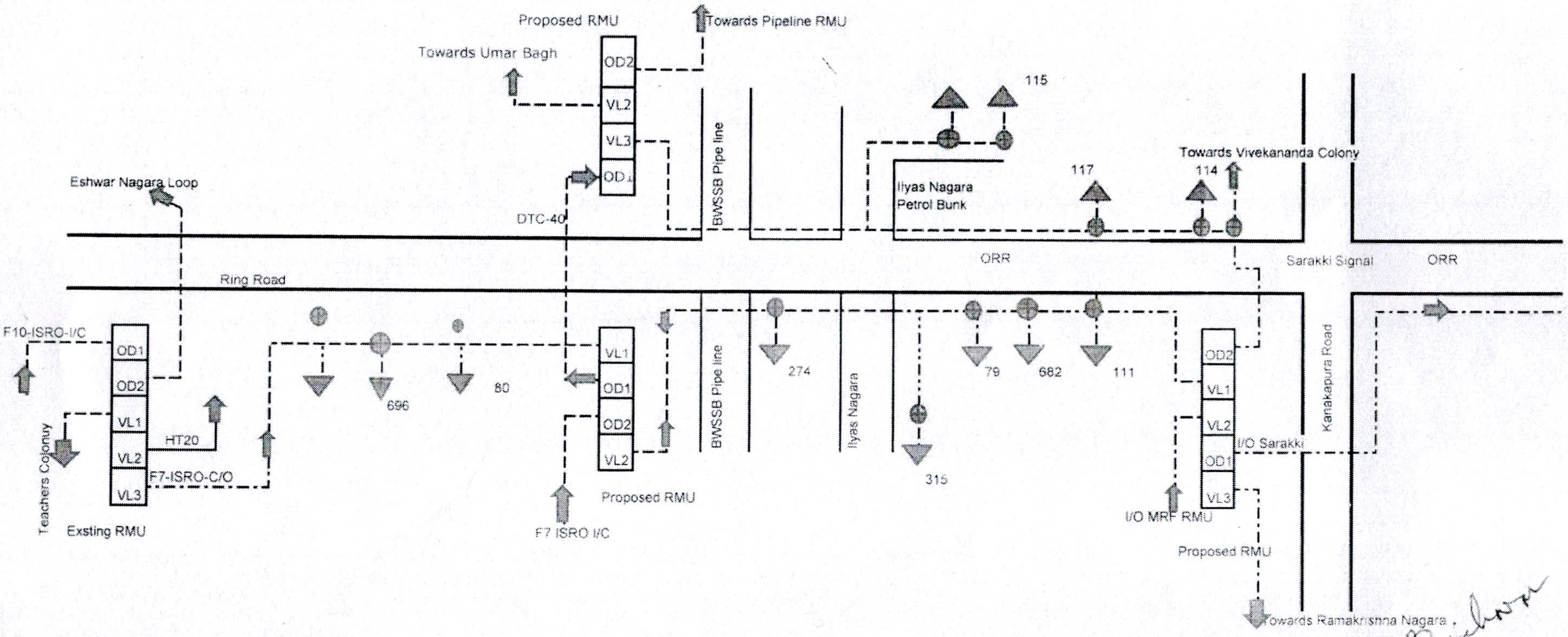
RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
S-5 Sub Division BESCOM,
Bangalore

[illegible]
S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078.

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

(Govt. of Karnataka Undertaking)

Estimate for shifting & conversion of existing electrical lines/DTC's/RMU's/Poles from GSI ORR junction to Sarakki Signal along ORR as per the request of Executive Engineer(Planning Division-3) BBMP Annexure building-2, A.N.Road Bangalorein O&M unit-1, ISRO Layout, S-5 sub-division, Bangalore-78. under self execution



Asst. Executive Engineer(Ele.),
S-5 Sub dvn, BESCOM
ISRO Layout, Bangalore

ISRO LAYOUT, BANGALORE-560 078.

Assistant Engineer(Ele.)
O&M unit-1, S5-8 S/D, BESCOM
ISRO Layout, B'lore-62

RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
S-5 Sub Division BESCOM,
Bangalore

11 AUG 2020
09 53 AM

BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

150031-ISRO LAYOUT OMU

WORK ORDER REPORT

Work Type: Regular

Est. Start Date:

Priority: 0
Required:
Task Status: PLANNING
Assigned To: RAJESH04
Contractor :

Work Order *1488926*

Task *01*

Budget Head :

Execution Method: SELF EXECUTION

Task Desc.: Release estimate for Estimate for shifting & conversion of existing electrical lines/DTC's/RMU's/Poles from GSI ORR junction to Sarakki Signal along ORR as per the request of Executive Engineer(Planning Division-3) BBMP Annexure building-2, A.N.Road Bangalorein O&M unit-1, ISRO Layout, S-5 sub-division, Bangalore-78. under self execution

Component ID:
Description:
Dept/Area: 150031-ISRO LAYOUT OMU

Task Note Type	Notes
CERTIFICATE	Certified that I have inspected the spot and prepared this estimate by using current SR for the most economical and safest way of executing the work.

MATERIALS:

S.NO	Store	Stock Code	Item Description	Rate	Qty Est	UOM	Amount(INR)	Utility Provided(Y/N)
1	NDS	790401	SCRAP MATERIALS | Iron Items | Scrap GOS with insulators	25	-35	KG	-875	N
2	NDS	790104	SCRAP MATERIALS | Iron Items | Cross arms, clamps etc.	27	-120	KG	-3240	N
3	NDS	790103	SCRAP MATERIALS | Iron Items | Released steel from RCC Poles (Skeleton Rods)	20	-200	KG	-4000	N
4	NDS	791101	SCRAP MATERIALS | ACSR conductor	111	-928	KG	-103008	N

Sub Total : -111123

LABOR

S.NO	Stock Code	Item Description	Rate	Qty Est	UOM	Amount(INR)	Utility Provided(Y/N)

Sub Total :

OTHER REQUIREMENTS:

Requirement	Item Description	Amount(INR)

Sub Total :

Submitted by: RAJESH04

RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
S-5 Sub Division BESCOM,
Bangalore

ASSISTANT EXECUTIVE ENGINEER(Ele.)
S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078.

WORK ORDER REPORT

	-111123			
OVERALL TOTAL	-111123	0	0	-111123

RAJESH .N.M.
Assistant Engineer (ELE)
O & M Unit I, ISRO Layout,
S-5 Sub Division BESCOM,
Bangalore

ASSISTANT EXECUTIVE ENGINEER (Ele.)
S-5, SUB DIVISION, BESCOM
ISRO LAYOUT, BANGALORE-560 078

ತಂತಿ:"ವಾಟರ್ ಸಪ್"ಬೆಂಗಳೂರು

ದೂರವಾಣಿ: 080-26851990

ಬೆಂಗಳೂರು ನೀರು ಸರಬರಾಜು ಮತ್ತು ಒಳಚರಂಡಿ ಮಂಡಳಿ

BANGALORE WATER SUPPLY AND SEWERAGE BOARD

Office of The AEE (S)-1 Sub division, BWSSB, Jambu Savari Dinne, J.P.Nagar 8th Phase, Bangalore-76

ಸಂ:ಬೆಂ.ಜ.ಮಂ./ದ1ಟಿಇ/ಸ.ಅ/ 1638 /2020-21 ದಿನಾಂಕ: 12/11/2020

ಗೆ,

ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು (ಯೋಜನೆ ಕೇಂದ್ರ-3)ರವರ ಕಚೇರಿ,
ಅನೆಕ್ಸ್‌ಕಟ್ಟಡ-2, ಎನ್.ಆರ್.ರಸ್ತೆ,
ಬೆಂಗಳೂರು-560002.

ಮಾನ್ಯರೇ,

ವಿಷಯ: ಹೊರ ವರ್ತುಲ ರಸ್ತೆಯ ಸಾರಕ್ಕಿ ಜಂಕ್ಷನ್‌ನ ಮೇಲು ಸೇತುವೆ ಕಾಮಗಾರಿಗೆ ಅಡ್ಡ ಬರುತ್ತಿರುವ ಬೆಂಗಳೂರು ಜಲಮಂಡಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೇವಾ ಮಾರ್ಗಗಳನ್ನು ಸ್ಥಳಾಂತರಿಸಲು ಅಂದಾಜುನ್ನು ನೀಡುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: ಸಂ:ಕಾ.ಅ/ಯೋಕೇ-3/ಪಿಆರ್/271/2019-20 ದಿ:11.12.2019.

ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂದಿಸಿದಂತೆ, ಹೊರ ವರ್ತುಲ ರಸ್ತೆಯ ಸಾರಕ್ಕಿ ಜಂಕ್ಷನ್ ಹತ್ತಿರ ಮೇಲು ಸೇತುವೆಯನ್ನು ನಿರ್ಮಿಸಲು ಬಿ.ಬಿ.ಎಂ.ಪಿ ಯಿಂದ ಉದ್ದೇಶಿಲಾಗಿದ್ದು, ಇದರ ಪ್ರಯುಕ್ತ ಬೆಂಗಳೂರು ಜಲಮಂಡಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೇವಾ ಮಾರ್ಗಗಳನ್ನು ಸ್ಥಳಾಂತರಿಸಲು ಅಂದಾಜು ವೆಚ್ಚವನ್ನು ಸಲ್ಲಿಸಲು ಕೋರಲಾಗಿರುತ್ತದೆ. ನಮ್ಮ ಉಪವಿಭಾಗದ ವ್ಯಾಪ್ತಿಗೆ ಸಾರಕ್ಕಿ ಸಿಗ್ನಲ್‌ನಿಂದ ಪುಟ್ಟೇನಹಳ್ಳಿ ಕೆಳ ಸೇತುವೆ ವರೆವಿಗೂ ಒಳಚರಂಡಿ ಕೊಳವೆ ಮಾರ್ಗ ಹಾಗೂ ನೀರಿನ ಕೊಳವೆ ಮಾರ್ಗವನ್ನು ಎರಡೂ ಬದಿಯಲ್ಲಿ ಸ್ಥಳಾಂತರಿಸಬೇಕಾಗಿರುವುದರಿಂದ ಇದಕ್ಕೆ ಅಂದಾಜು ತಗಲುವ ವೆಚ್ಚ ರೂ.3,75,00,000/-ಗಳಾಗಿರುತ್ತದೆ ಎಂದು ಈ ಮೂಲಕ ತಮ್ಮ ಆದ್ಯ ಗಮನಕ್ಕೆ ತರಲಾಗುತ್ತಿದೆ.

ವಂದನೆಗಳೊಂದಿಗೆ,

ತಮ್ಮ ವಿಶ್ವಾಸಿ,

ಸಹಾಯಕ ಕಾರ್ಯ ನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು
ದಕ್ಷಿಣ-1ನೇ ನೀರು ಮತ್ತು ಒಳಚರಂಡಿ ಉಪವಿಭಾಗ,
ಜಂಬೂಸವಾರಿದಿಣ್ಣೆ, ಜೆ.ಪಿ.ನಗರ 8ನೇ ಹಂತ, ಬೆಂ-76.

19/11/2020
181/20-21

AEE
19/11/2020

ಬೆಂಗಳೂರು ನೀರು ಸರಬರಾಜು ಮತ್ತು ಒಳಚರಂಡಿ ಮಂಡಳಿ
BANGALORE WATER SUPPLY AND SEWERAGE BOARD
Office of the Assistant Executive Engineer,No.1 w/s and sanitary Sub division,Banagirinagar,BSK 3rd stage B'lore-85

NO: BWSSB/ADSW4/EST-1/ 1943 /2020-21 Date:21 .11.2020

ಗೆ,
ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು.
ಯೋಜನೆ ಕೇಂದ್ರ-3 ಕಛೇರಿ.
ಅನೆಕ್ಸ್ ಕಟ್ಟಡ-2, ಎನ್.ಆರ್, ರಸ್ತೆ,
ಬೆಂಗಳೂರು-560002

ಮಾನ್ಯರೇ,

ವಿಷಯ: ಹೊರ ವರ್ತುಲ ರಸ್ತೆಯ ಸಾರಕ್ಕಿ ಜಂಕ್ಷನ್ ನ ಮೇಲು ಸೇತುವೆ ಕಾಮಗಾರಿಗೆ ಅಡ್ಡ ಬರುತ್ತಿರುವ ಬೆಂಗಳೂರು ಜಲಮಂಡಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೇವಾ ಮಾರ್ಗಗಳನ್ನು ಸ್ಥಳಾಂತರಿಸಲು ಅಂದಾಜನ್ನು ನೀಡುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: ಸಂ.ಕಾ.ಅ/ಯೋಕೇ-3/ಪಿಆರ್/271/2019-20 ದಿನಾಂಕ: 11.12.2019

ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಹೊರ ವರ್ತುಲ ರಸ್ತೆಯ ಸಾರಕ್ಕಿ ಜಂಕ್ಷನ್ ಹತ್ತಿರ ಮೇಲು ಸೇತುವೆಯನ್ನು ನಿರ್ಮಿಸಲು ಬಿ.ಬಿ.ಎಂ.ಪಿ ವತಿಯಿಂದ ಆದೇಶಿಸಲಾಗಿದ್ದು, ಅದರ ಪ್ರಯುಕ್ತ ಬೆಂಗಳೂರು ಜಲಮಂಡಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೇವಾಮಾರ್ಗಗಳನ್ನು ಸ್ಥಳಾಂತರಿಸಲು ತಗಲುವ ಅಂದಾಜು ವೆಚ್ಚವನ್ನು ಸಲ್ಲಿಸಲು ಕೋರಲಾಗಿರುತ್ತದೆ.

ಮುಂದುವರಿದಂತೆ, ನಮ್ಮ ಉಪವಿಭಾಗದ ವ್ಯಾಪ್ತಿಗೆ ಸಾರಕ್ಕಿ ಸಿಗ್ನಲ್‌ನಿಂದ ತಕ್ವ ಮಸೀದೀ ರಸ್ತೆ, ಇಲಿಯಾಸ್ ನಗರದವರೆಗೂ ಮೇಲು ಸೇತುವೆಯ ಕಾಮಗಾರಿಯನ್ನು ಕೈಗೊಳ್ಳುವುದಾಗಿ ಸೂಚಿಸಿರುತ್ತಾರೆ. ಆದ್ದರಿಂದ ಈ ರಸ್ತೆಯಲ್ಲಿ ಎರಡು ಬದಿಯಲ್ಲಿ ಬರುವ ಒಳಚರಂಡಿ ಕೊಳವೆಯನ್ನು ಮತ್ತು ನೀರಿನ ಕೊಳವೆ ಮಾರ್ಗಗಳನ್ನು ಬದಲಿಸಿ ಸ್ಥಳಾಂತಲಿಸ ಬೇಕಾಗಿರುವುದರಿಂದ ಅದಕ್ಕೆ ತಗಲುವ ಅಂದಾಜು ವೆಚ್ಚವು ರೂ. 1,60,00,000/- (ಒಂದು ಕೋಟಿ ಅರವತ್ತು ಲಕ್ಷ ರೂಪಾಯಿಗಳು ಮಾತ್ರ) ಗಳು ಆಗಿರುತ್ತದೆ. ಈ ಮೂಲಕ ತಮ್ಮ ಆದ್ಯ ಗಮನಕ್ಕೆ ತರಲಾಗಿರುತ್ತದೆ.

ವಂದನೆಗಳೊಂದಿಗೆ,

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು,
ನೀರು ಸರಬರಾಜು ಮತ್ತು ಒಳಚರಂಡಿ ಉಪ-ವಿಭಾಗ(ದಪ)-4
ಬನಗಿರಿ ನಗರ ಬೆಂಗಳೂರು 560 085.

27/11/2020

ಪ್ರತಿಯನ್ನು : -

1. ಕಾನಿಅ(ದಪ) ರವರ ಘನ ಅವಗಾಹನೆಗೆ ಸಲ್ಲಿಸಲಾಗಿದೆ.
2. ಕಛೇರಿ ಕಡತಕ್ಕೆ.

23/11/2020
184/20-21

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Grams: *"Water Sup" Bangalore*
e-Mail:aees-1@bwssb.gov.in
TELE PHONE-(080)-22945198

BENGALURU WATER SUPPLY AND SEWERAGE BOARD
Office of the Assistant Executive Engineer, w/s and sanitary South West-4 Sub division,Banagirinagar,BSK 3rd stage B'luru-85

NO:BWSSB /SW4TE/ AE4/ 2035 **/2020** **DATE:** 30/11/2020

To,
EESW.

Sub:- Estimate for the work of providing and laying of 100mm and 150 mm DI water line in from Sarakki signal to pipeline road iliyas nagar outer ring road coming under banashankari service station of AEESW-4 Sub division to shift the existing utilities for construction of flyover by BBMP.

Ref:- ಸಂಖ್ಯೆ: ಕಾ.ಪಾ.ಅ/ಯೋ.ಕೇ-3/ಪಿ.ಆರ್/271/2019-20 ದಿನಾಂಕ: 11.12.2020.

*****

With reference to the above subject, the estimate for the above work amounting to Rs 31,60,000/- (Rs. Thirty-one Lakh sixty thousand Only) is here with submitted for approval. The estimate is prepared based on the BWSSB SR for the year 2017-18. The report accompanying the estimate explains the necessity of the work and provisions made therein.

The cost of the estimate is chargeable to DC works of private property for the year 2019-20.

Encl:- Estimate , report, sketch in triplicate

Assistant Executive Engineer
Water Supply & Sewerage Subdivion(SW)-4
BWSSB, Banagari, Bangalore

Early copy to EE(Central project-3), Annex, N.R Road, BBMP, Bangalore-560002.

AEE
01/12/2020

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Estimation for the work of providing and laying 100mm and 150mm dia DI water line from Sarakki signal to pipeline road iliyas nagar outer ring road coming under banashankari service station of AEESW-4 sub division to shift the existing utilities for construction of flyover by BBMP.

The estimate has been prepared and herewith submitting to accord kind approval for Rs./-

The BBMP authorities had corresponded to this office regarding construction of Flyover Bridge on Sakkari Signal, the Flyover has been proposed from Puttenahalli underpass to Bharath Petrol bunk near illiyas nagar. So, the BBMP authorities has inform to submit the estimate the for shifting the BWSSB utilities in outer ring road in that stretch to Right of Way to include in DPR preparing by M/s, Nagesh Consultant. Hence, the site has been inspected with BBMP officers and estimate has been prepared for shifting of 150mm dia and 100mm dia DI water pipe line present in stretch from sarakki signal to pipeline road near iliyas nagar outer ring road.

The provision such as Asphalt road cutting, Earth work excavation, Refilling of excavated earth, providing & laying of 150mm dia. and 100mm dia DI pipe line, DI specials to link with feeder mains, AIR Valves and Control Valves and disposal of earth , Road restoration works etc., have been made in the estimate were quite essential to execute the work.

The cost of the estimate of Rs.31,60,000/- as per current SR of BWSSB for the year 2017-18 is chargeable to DC works of BBMP for the year 2020-21.

AE

AEESW-4

EEW

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Estimation for the work of providing and laying 100mm and 150mm dia DI water line from Sarakki signal to pipeline road Iliyas nagar outer ring road coming under banashankari service station of AEESW-4 sub division to shift the existing utilities for construction of flyover by BBMP.

Sl.No.	Particulars	No.	L	B	D	Qty	Unit	Quantity	Rate	Amount
1	Cutting road surfaces for pipeline trenches and disposing of the excavated stuff as directed including barricading,danger lighting etc.in the classifications									
	(2) Cutting Asphalt road(SR:2017-18,P.56,SLNO.16.2CODE(A105B)									
	100MM		680	0.6	0.3	122.40	m3	122.40	894.00	109425.60
	150MM		150	0.6	0.3	27.00	m3	27.00	894.00	24138.00
2	EXCAVATING FOR PIPE LINE TRENCHES OF REQUIRED WIDTH by mechanical / & manual means including dressing sides,ramming of bottoms, providing barricading, danger lighting, shoring,strutting, dewatering, etc. IN ALL KINDS OF SOIL MIXED WITH BOULDERS of 30 cms size, etc. for: Pipes of all dia. for depth upto 2.0 M in all types of soils Note : If any shoring and strutting, will be paid separately (SR:2017-18,P.51,SLNO.1.1CODE(A050A)									
	(1) , 0 to 2.00 m depth		830	0.6	0.9	448.20	m3	448.20	167.00	74849.40
3	EXCAVATING FOR PIPE LINE TRENCHES OF REQUIRED WIDTH by mechanical / & manual means including dressing sides, ramming of bottoms, providing barricading, danger lighting, shoring,strutting, dewatering, etc. IN HARD ROCK BY CHISTELLING TO PROPER SLOPE etc. for: (SR:2017-18,P.52,SLNO.5.1CODE(A068A)									
	Pipes of all dia. for depth upto 2.0 M Note : If any shoring and strutting, will be paid separately.25% of Earth Qty= 448.2x0.15=67.23					112.05	m3	112.05	1487.00	166618.35
4	Providing and laying Ductile iron pipes of class-K9 conforming to IS 8329:2000 with latest amendments, conveying to work site, rolling and lowering into trenches, laying true to line, level and perfect linking at joints, testing and commissioning, including loading and unloading at both destinations, cutting of pipes wherever necessary, jointing with DI specials (excluding cost of specials) and rubber gaskets, cleaning the socket and spigot end with soap solution, applying soft soap to the socket and spigot ends before insertion of rubber gaskets, jacking and fixing in perfect conditions etc. The cost to include soap solution, soft soap, waste etc. and giving necessary hydraulic test to the required pressure as per ISS with all lead and lifts and cost of all jointing materials. (The contractor will make his own arrangements for water for testing. Earth work excavation in trenches and jointing of pipes to be measured and paid for separately) Note: In sewerage projects for internal cement mortal lining (CML) of DI pipes, if High Alumina Cement (HAC) as recommended in Annexure B clause 16.3 of IS8329:2000 is considered in place of Slag or Sulphate Resistance Cement (SRC), the cost of pipes may be increased by 5-6% from the prices listed above. (SR:2017-18,P.82,SLNO.2.1CODE(E020)									
	100mm dia DI pipes		680				Rmt	680.00	1359.00	924120.00
	150MM DIA		150				Rmt	150.00	1955.00	293250.00
5	Supplying and fixing DI Resilient seated soft sealing SLUICE VALVE of various dia. with body, bonnet of ductile iron (DI) conforming toIS-1865 and of grade GGG50, shaft of stainless steel, wedge fully rubber lined with EDPM seals of NBR and the valves should be vacuum tight and 100% lead proof with face dimensions as per BS 5163-89 / IS 14846-2000 / DN 3202 F4/F5. The stem sealing should be with toroidal sealing rings (minimum 2 "O" rings). Body and bonut should be coated with Electrostatically applied Epoxy Power Coating with minimum coating thickness of 250 micron both inside and out side. The rate is inclusive of cost of valve, T.P set, bolts & nuts and rubber insertions etc. but excluding earth work. (SR:2017-18,P.69,SLNO.56 CODE(B076)									
	100mm dia,						Nos	4.00	10367.00	41468.00
	150mm dia						Nos	2.00	14889.00	29778.00

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6	Supplying and fixing kinetic AIR VALVE for automatic discharge of accumulate air during working condition, conforming to IS 14845 / EN 1074-4. Body and bonnet of DI conforming to IS-1865 of grade GGG-50, seals are made of approved EPDM, SS 304 float, guide and internals. Flange drilling according to IS-1538 etc. complete. Body and bonnet shall be coated with electrostatically applied epoxy powder coating with a coating thickness of 250 micron both inside and outside.(SR:2017-18,P.71,SLNO.62.1CODE B083A				
	100mm dia,	Nos	1.00	16959.00	16959.00
7	Supplying Ductile Iron Push on special & confirming to IS 9523:2000 (Note : The Rates are inclusive of all taxes, duties & transportation charges)				
	(SR:2017-18,P.43,SLNO.1CODE(A010)				
	100 x 90' Bend	Nos	4.00	1097.00	4388.00
	100 x 45' Bend	Nos	6.00	1093.00	6558.00
	100 x 22 1/2' Bend	Nos	6.00	944.00	5664.00
	100 x 11 1/4' Bend	Nos	6.00	897.00	5382.00
	150 x 90' Bend	Nos	3.00	2099.00	6297.00
	150 x 45' Bend	Nos	3.00	1596.00	4788.00
	150 x 22 1/2' Bend	Nos	3.00	1396.00	4188.00
	150 x 11 1/4' Bend	Nos	3.00	1396.00	4188.00
8	Supplying Ductile Iron Push on special confirming to S 9523:2000 - All Socketed D.I. Equal Tees Note : The Rates are inclusive of all taxes, duties & transportation charges				
	(SR:2017-18,P.44,SLNO.3.1CODE(A014)				
	100 x 100 mm dia Branch	Nos	12.00	1574.00	18888.00
	150 x 150 mm dia Branch	Nos	2.00	2492.00	4984.00
9	Supplying Ductile Iron Push on special confirming to IS 9523:2000 - Double Socketed with flange Branch D I Un Equal Tee Note : The Rates are inclusive of all taxes, duties & transportation charges				
	(SR:2017-18,P.45,SLNO.4.1CODE(A015)				
	150 x 150x100 mm dia Branch	Nos	2.00	2372.00	4744.00
10	Providing, fabricating, supplying and fixing at site various diameter MS MJ ends with dummy plates (END CAPS) to suit CI / DI spigots end as per the sketch. The cost is inclusive of all materials, i.e, rubber 'O' rings, flanges, bolts and nuts, dummy plates, consumables, hire charges, tools and welding equipments, lead and lifts, etc. complete as per the instructions of Engineer in charge				
	(SR:2017-18,P.72,SLNO.65 CODE(B090)				
	100mm dia	Nos	2.00	1280.00	2560.00
	150mm dia	Nos	1.00	1729.00	1729.00
11	Supplying Ductile Iron Push on special confirming to IS 9523:2000 - All D.I. Flanged Socketed, D.I. Flanged MJ COLLAR				
	(SR:2017-18,P.49,SLNO.10.1CODE(A026A)				
	100mm dia	Nos	15.00	2127.00	31905.00
	150mm dia	Nos	5.00	3836.00	19180.00
12	Supplying Ductile Iron Push on special confirming to IS 9523:2000 - All D.I. Flanged Socketed Note : The Rates are inclusive of all taxes, duties & transportation charges				
	(SR:2017-18,P.48,SLNO.9.1CODE(A025A)				
	100mm dia	Nos	10.00	923.00	9230.00
	150mm dia	Nos	4.00	1510.00	6040.00
13	Supplying Ductile Iron Push on special confirming to IS 9523:2000 - All D.I. Flanged Spigot Note : The Rates are inclusive of all taxes, duties & transportation charges				

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	(SR:2017-18,P.48,SLNO.9.10CODE(A025J)									
	100mm dia									
	150mm dia									
							Nos	10.00	1079.00	10790.00
							Nos	4.00	1639.00	6556.00
14	Fixing CI / DI specials of mechanical jointing of different sizes after setting into the pipe line system, including cleaning. Introducing rubber gasket to proper alignment and lightening with bolts and nuts. The cost includes transportation of materials, tools and plants etc.The CI / DI mechanical specials with bolts, nuts, washers and rubber gaskets etc. will be supplied free of cost by the Board. (SR:2017-18,P.67,Sl.48.1 CODE(B066)									
	100mm dia									
							Nos	101.00	35.00	3535.00
15	KSRRB M200-12.3. Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts complete as per specifications.(C-Prestressed / Reinforced cement concrete grade M-20 & above.) MORTH Specification No. 202 (PWD SR-2016-17/Page No.136/Sl No.18.19)									
	L/S	20	1.00	1.00	0.20	4.00	cum	4.00	1022.00	4088.00
16	Refiling of availabale earth around pipelines, in layers not exceeding 20cms in depth, compacting each deposited layer by ramming after watering all lead and lift including cost of all labour including consolidation by mechanical means approved by engineer incharge, when earth is at suitable moisture content with desired field density upto 95% max dry density (modified heavey proctor test) for restoration of roads without settelement including HOM of machineeries, complete. The contractor shall take care while consolidating the earth, so that, pipes laid are not damaged due to mechanical completion and shall restore the damaged pipes at his own cost, in case of damage).(SR:2017-18, P.56,									
	Total qty of earth work					597.60				
	i)100 mm Ø Pipe Qty.	3.14 x 0.15² ÷ 4 x680				-12.01				
	ii)150 mm Ø Pipe Qty.	3.14 x 0.20² ÷ 4 x 150				-4.71				
	iii)wet mix					-149.40				
	iv) Quarry dust					-99.60				
	V) butuminous					-44.82				
						287.06	Cum	287.06	103.00	29567.18
17	Provide bedding using approved stone dust / quarry dust of size not exceeding 5.6 mm for the pipe lines trenches including watering and consolidation to 95% proctor density etc. complete with all lead and lifts as per specifications and as directed by the Engineer in charge etc and after obtaining the approval of the Chief Engineer.. SR 2017 2018 P.No.56, Sl. No.18, A108A (FOR PIPE TOP)									
	100mm dia/150MM	1	830.00	0.60	0.20	99.60				
						99.60	CUM	99.60	952.00	**94819.20**
18	Providing laying spreading and compacting graded stones aggregates to wet mix macadum specification including premixing the materials with water at OMC in mechanical mix plant carryage of mixed method of Tipper to site laying in uniform layers with paver in sub base course onwell prepared surface and compacting with vibratary roller to achieve disered density complete as per specifications . SR 2016-17 P. No.283 I.No. 20.18									
			830	0.6	0.3	149.40	CUM	122.40	1668.00	204163.20
19	**KSRRB 500 Primer Coat**									
	KSRRB 500 : Providing and applying primer coat withS S bitumen emulsion on prepared surface of granular base including clearing of road surface and spraying primer at the rate of .60kg/sqm using mechanical means. Complte as per specification MORTH specification no. 502 (SR: 2016-17, P-285, I-21.6)									
		1	830.00	0.60		498.00	Sqm	498.00	26.00	12948.00

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20	**KSRRB 500 Bituminous macadam**									
	KSRRB 500 11: Providing and applying bitumen macadam on prepared surface with crush coarse aggregates as per design mix formula for base/ binding course including loading of aggregate with F.e loader, hot mixing of stone aggregate and bitumen in hot mix plant 40 tonne capacity, transporting the mixed material in tipper to paver and laying mixed material with paver finisher to the required level and grade, rolling by power roller to achive the desire density, 50/75mm compacted thickness with 3.3% bitumen but excluding cost of primer/ track coat with lead up to 1 km including cost of material, labour HOM of machineries complete as per specification MORTH/ CHAPTER 5(SR: 2016-17, P-286, I-21.11.2)									
	Gr II 50 mm to75mm									
		1	830.00	0.60	0.050	24.90	Cum	24.90	5409.00	134684.10
21	**TACK COAT**									
	KSRRB 500 : Providing and applying Tack coat on prepared black topped surface at .5 kg per 10sqm, heating Bitumen in boiler fitted withspray set (excluding cleaning of road surface) including cost of all material, labour, HOM of machineriescomplete as per specification									
	(SR: 2016-17, P-285, I-21.7)									
		1	830.00	0.60		498.00	Sqm	498.00	11.00	5478.00
22	**BITUMINOUS CONCRETE** KSRRB 500 providing and laying bituminous concrete with hot mix plant , usng crushed aggregate of specified grading, premixed with bituminous binder and filler, transporting the hot mix to work site laying with a paver fineshar to the requrired grade, level and alligmeng rolling with smooth wheeled, vibratory and tandom rollers to achive the desired compaction as per morth specification class no 500.9 complete in all respect as per specification. using 100/120 TPH capacity HMP with senser paver GR-2 (30 TO 45MM) with 5.4% VG -30 BITUMEN. (SR: 2016-17, P-288, I-21.22.2)									
		1	830.00	0.60	0.040	19.92	CUM	19.92	7068.00	140794.56
23	Disposal off the excess excavated earth of all types by vehicle including loading, unloading with all lead and lifts, labour, HOM of machineries etc. for: for:SR 2017-18 P. No.57, SL.No.20.5 CODE A115E (Up to 15km)									
	Total Qty = Total EW - Refiliing =597.6-287.06=310.54									
	TOTAL						m3	310.54	343.00	106515.22
										2575257.81
	ABSTRACT									
	Total ESTIMATED COST									
	TENDER PERCENTAGE@ 15%									2575257.81
	ETP CHARGES@ 5%									386288.67
	THIRD PARTY INSPECTION CHARGES 0.50%									128762.89
	THIRD PARTY GST18%									12876.289
	Advertisement Charges									2317.732
	Miscellenious and Unforcin Items & Round Off									50000.00
	Grand Total									4497.00
										3160000.39

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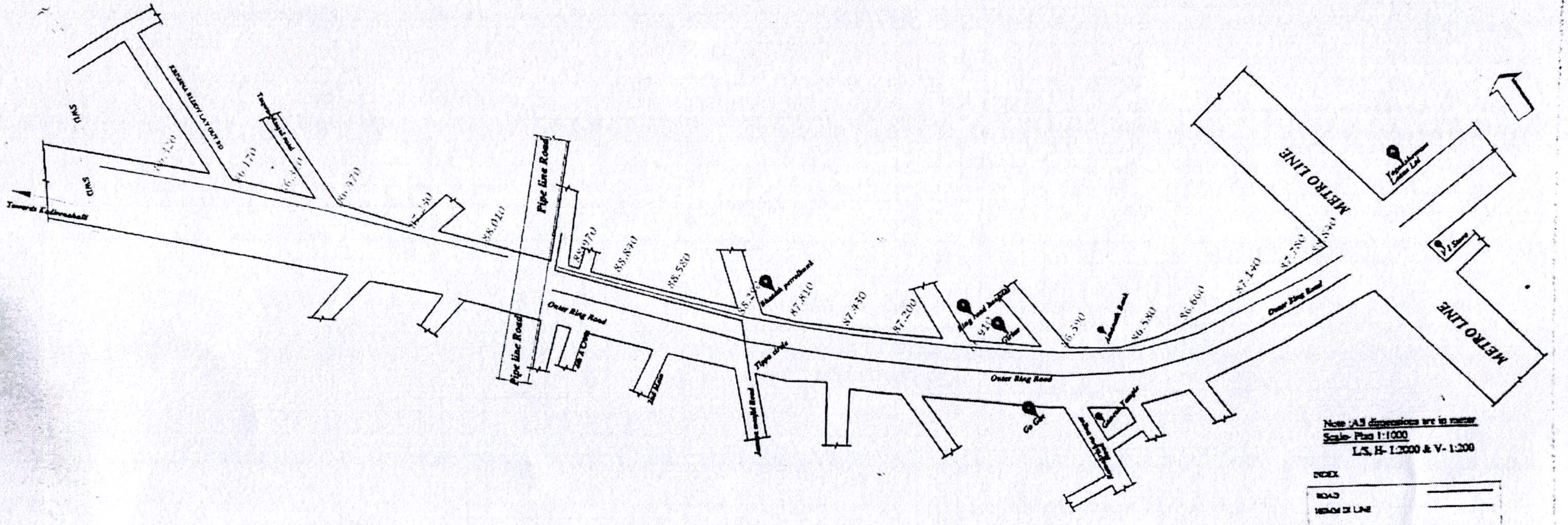
AEESW-4

EESW



Note :All dimensions are in meter
Scale- Plan 1:1000
L.S. H- 1:2000 & V- 1:200

INDEX

ROAD	———
160MM DI LINE	———
150MM DI LINE	———
DRAIN	- - -

SKETCH SHOWING FOR THE WORK OF PROVIDING LAYING AND REPLACING 160MM AND 150MM DIA DI WATER LINE FROM SARAKKI SIGNAL TO UMARBAG LAYOUT OUTER RING ROAD COMING UNDER BANASHANKARI SERVICE STATION OF ASE SW-4 SUB DIVISION

"[illegible]" Surveyors

Grams: *"Water Sup" Bangalore*
e-Mail:aees-1@bwssb.gov.in

TELE PHONE-(080)-22945198

BENGALURU WATER SUPPLY AND SEWERAGE BOARD
Office of the Assistant Executive Engineer, w/s and sanitary South West-4 Sub division,Banagirinagar,BSK 3rd stage B'luru-85

NO:BWSSB /SW4TE/ AE4/ 2036 **/2020** **DATE:** 30/11/2020

To,
EESW-4

Sub: -Estimate for the work of providing and laying 300mm dia RCC NP3 class pipe line from Sarakki signal to pipeline road iliyas nagar outer ring road coming under banashankari service station of AEESW-4 Sub division to shift the existing utilities for construction of flyover by BBMP.

Ref:- ಸಂಖ್ಯೆ: ಕಾ.ಪಾ.ಅ/ಯೋ.ಕೇ-3/ಪಿ.ಆರ್/271/2019-20 ದಿನಾಂಕ: 11.12.2020.

*****

With reference to the above subject, the estimate for the above work amounting to Rs.50,70,000.00 is here with submitted for approval. This work has been proposed to avoid the sewer entering into the SWD in Banashankari, as per the orders of National Green Tribunal(NGT).

The estimate is prepared based on the BWSSB SR for the year 2017-18. The report accompanying the estimate explains the necessity of the work and provisions made therein.

The cost of the estimate is chargeable to DC works of private property for the year 2019-20

Encl:- Estimate , report, sketch in triplicate

Assistant Executive Engineer
Water Supply & Sewerage Subdivion(SW)-4
BWSSB, Banagari, Bangalore

✓Early copy to EE(Central project-3), Annex , N.R Road, BBMP, Bangalore-560002.

AEE
01/12/2020.

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Estimate for the work of providing and laying of 300mm dia RCC NP3 class pipe line from sarakki signal to pipeline road, iliyas nagar outer ring road coming under Banashankari service station of AEESW-4 sub division toShift the existing utilities for construction of Flyover by BBMP.

The estimate has been prepared and herewith submitting to accord kind approval for Rs./-

The BBMP authorities had corresponded to this office regarding construction of Flyover BridgeonSakkari Signal, the Flyover has been proposed from Puttenahalli underpass to Bharath Petrol bunk near illiyas nagar. So, the BBMP authorities has inform to submit the estimate the for shifting the BWSSB utilities in outer ring road in that stretch to Right of Way to include in DPR preparing by M/s, Nagesh Consultant. Hence, the site has been inspected with BBMP officers and estimate has been prepared for shifting of 300MM dia RCC NP3 class pipe line present in stretch from sarakki signal to pipeline road, iliyas nagar outer ring road

The provision such as Asphalt road cutting, Earth work excavation, Refilling of excavated earth, providing & laying of 300mm dia. RCC , Construction of new manholes and disposal of earth , Road restoration works etc., have been made in the estimate were quite essential to execute the work.

The cost of the estimate of Rs.50,70,000/- as per current SR of BWSSB for the year 2017-18 is chargeable to DC works of BBMP for the year 2020-21.

Early sanction to the estimate is requested.

AE **AEESW-4** **EESW**

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Estimate for the work of providing and laying of 300mm dia RCC NP3 class pipe line from sarakki signal to pipeline road, iliyas nagar outer ring road coming under Banashankari service station of AEESW-4 sub division to Shift the existing utilities for construction of Flyover by BBMP.

Sl.No.	Particulars	No.	L	B	D	Qty	Unit	Quantity	Rate	Amount
1	Cutting road surface forpipe line trenches and disposing off the excavated stuff as directed including barricading, danger lighting etc., in the following classification									
	(2) Cutting Asphalt road(SR:2017-18,P.56,SLNO.16.2CODE(A105B)									
	MH 1 to MH 2	1	14.00	1.00	0.30	4.20				
	MH 2 to MH 3	1	44.00	1.00	0.30	13.20				
	MH 3 to MH 4	1	43.00	1.00	0.30	12.90				
	MH 4 to MH 5	1	23.00	1.00	0.30	6.90				
	MH 5 to MH 6	1	30.00	1.00	0.30	9.00				
	MH 6 to MH 7	1	30.00	1.00	0.30	9.00				
	MH 7 to MH 8	1	30.00	1.00	0.30	9.00				
	MH 8 to MH 9	1	49.00	1.00	0.30	14.70				
	MH 9 to MH 10	1	38.00	1.00	0.30	11.40				
	MH 10 to MH 11	1	30.00	1.00	0.30	9.00				
	MH 11 to MH 12	1	30.00	1.00	0.30	9.00				
	MH 12 to MH 13	1	30.00	1.00	0.30	9.00				
	MH 13 to MH 14	1	21.00	1.00	0.30	6.30				
	MH 21 to MH 20	1	35.00	1.00	0.30	10.50				
	MH 20 to MH 19	1	30.00	1.00	0.30	9.00				
	MH 19 to MH 18	1	30.00	1.00	0.30	9.00				
	MH 18 to MH 17	1	23.00	1.00	0.30	6.90				
	MH 17 to MH 16	1	49.00	1.00	0.30	14.70				
	MH 16 to MH 15	1	33.00	1.00	0.30	9.90				
	MH 19 to MH 22	1	36.00	1.00	0.30	10.80				
	MH 22 to MH 23	1	30.00	1.00	0.30	9.00				
	MH 23 to MH 24	1	30.00	1.00	0.30	9.00				
						212.40				
	Asphalt Cutting for Lateral Linking									
		1	230.00	0.80	0.30	55.20				
		-22	2.18	1.00	0.30	-14.39				
						253.21	Cum	253.21	894.00	226371.53
2	Earth work excavation for pipeline trenches required width by mechanical /& manual means incl dressing sides, ramming of bottoms, providing baricasing.danger lighting .shoring, strutting, dewatering, etc, directed in the following strata.									
	1) In all kinds of soils mixed with boulders of 30 cms size up if any shoring and strutting will be paid separately.									
A	(1) **0 to 2 Mtr. Depth** (SR:2017-18,P.51,SLNO.1.1CODE(A050A)									
	MH 1 to MH 2	1	14.00	1.00	1.50	21.00				
	MH 2 to MH 3	1	44.00	1.00	1.60	70.40				
	MH 3 to MH 4	1	43.00	1.00	1.80	77.40				
	MH 4 to MH 5	1	23.00	1.00	1.75	40.25				
	MH 5 to MH 6	1	30.00	1.00	1.55	46.50				
	MH 6 to MH 7	1	30.00	1.00	1.50	45.00				
	MH 7 to MH 8	1	30.00	1.00	1.50	45.00				
	MH 8 to MH 9	1	49.00	1.00	2.00	98.00				
	MH 9 to MH 10	1	38.00	1.00	1.80	68.40				
	MH 10 to MH 11	1	30.00	1.00	1.55	46.50				
	MH 11 to MH 12	1	30.00	1.00	1.50	45.00				

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	MH 16 to MH 15	1	33.00			33.00				
	MH 19 to MH 22	1	36.00			36.00				
	MH 22 to MH 23	1	30.00			30.00				
	MH 23 to MH 24	1	30.00			30.00				
						708.00				
	Deduction for MH Qty	-22	1.20			-26.40				
						681.60	Rmt	681.60	1659.00	1130774.40
5	Refiliing of availabale earth around pipelines, in layers not exceeding 20cms in depth, compacting each deposited layer by ramming after watering all lead and lift including cost of all labour including consolidation by mechanical means approved by engineer incharge, when earth is at suitable moisture content with desired field density upto 95% max dry density (modified heavey proctor test) for restoration of roads without settelement including HOM of machineeries, complete. The contractor shall take care while consolidating the earth, so that, pipes laid are not damaged due to mechanical completion and shall restore the damaged pipes at his own cost, in case of damage).(SR:2017-18, P.56, SLNO14 CODE A095A)									
	Total qty of earth work					1235.92				
	i) 300 mm Ø Pipe Qty.	3.14 x 0.4² ÷ 4 x 681.8				-85.63				
	ii) 230 mm Ø Pipe Qty.	3.14 x 0.3² ÷ 4 x 230				-16.24				
	iii) Construction of MH's 22x 3.14 x1.50² ÷ 4 x1.51					-58.67				
	iv) quarry dust					-186				
	v)wet mix					-267.60				
	vi) butuminous					-77.72				
						544.06	Cum	544.063	103.00	56038.53
6	Providing and constructing "WIRE CUT BRICK MANHOLE CHAMBERS" using suplhate resistant cement, conical in shape at top, with CC 1:3:6 foundation using 40mm and down size graded metal of approved quality and with an offset of 0.15M alround the chamber. Construct Brick masonry in CM 1:4, 340 mm thick,with wirecut bricks of approved quality, plaster inside and out side with CM 1:3, 12mm thick, except for the conical surface outside where the plaster thickness shall be 20mm. Slope inside to be 1:6 in the concrete towards central drain and finished smooth. Fixing of pipes in CC 1:2:4 with graded metal of 20mm and down size. Supplying and fixing SFRC manhole frame and cover conforming to IS:12592 with latest amendment, in CC 1:2:4. Supplying and fixing footsteps made of 12mm dia. steel bars (Fe-415) with 3mm thick plastic encapsulation (IS-10910). The footsteps shall be fixed 30cms apart and on CC block embeded to masonry wall. The whole works include excavation in all types of soils, watering, curing, barricading, danger lighting,pouring tar over MH frame and cover, cost of tar, shoring, strutting, de-watering, engraving manhole number with flow direction on the inner conical surface etc. as per the drawing etc. as per technical specifications and for the following diameters and depth etc. for:(SR:2017-18, P.168, SLNO. 101 CODET300)									
	1.20 m diametre manholes, 1.0m Depth									
	MH No's	Depth NO'S								
	1.00 Mtrs Depth								18382	36764
	22,23	2								
	1.20 Mtrs Depth								20697	
	21,20	2.00								41394
	1.40 Mtrs Depth									

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		1	150.00	0.80	0.040	4.80	Cum	4.80	5409.00	25963.20
		1	708.00	1.00	0.040	28.32	CUM	28.32	7068.00	200165.76
15	Disposal off the excess excavated earth of all types by vehicle including loading, unloading with all lead and lifts, labour, HOM of machineries etc. for: for:SR 2017-18 P. No.57, SL.No.20.5 CODE A115E (Up to 15km)									
	Total qty of earthwork-refilling=1235.92-544.06=691.86							691.86		
							Cum	691.86	343.00	237307.98
	Total									4155338.85
	ABSTRACT									
1	Total ESTIMATED COST									4155338.85
2	TENDER PERCENTAGE@ 15%									623300.83
3	ETP CHARGES@ 5%									207766.94
4	INSPECTION CHARGES									20776.694
5	THIRD PARTY GST18%									3739.805
6	Advertisement Charges									50000.00
7	Miscellenious and Unforcin Items & Round Off									9077.00
	Grand Total									5070000.12

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EESW

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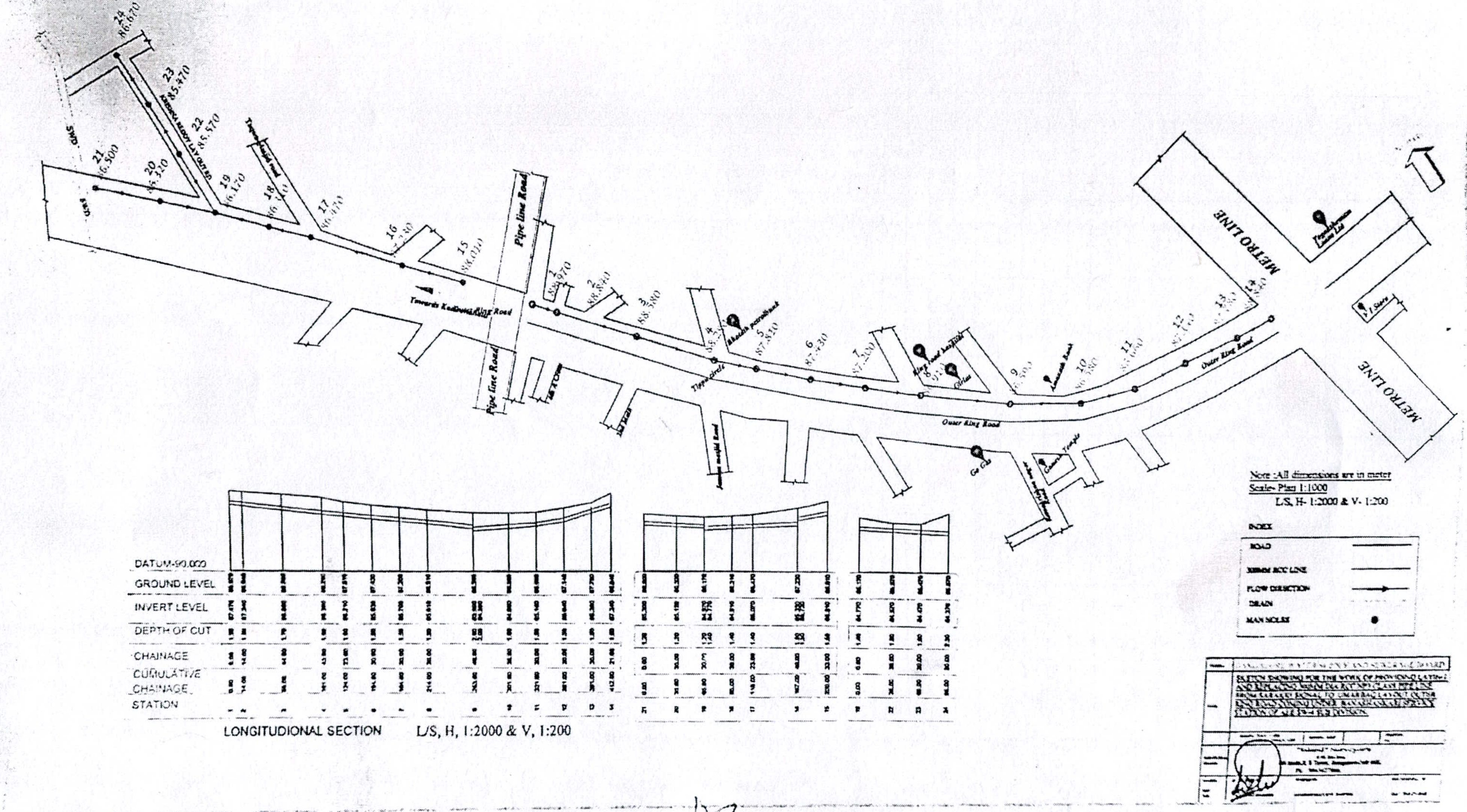

LONGITUDIONAL SECTION L/S, H, 1:2000 & V, 1:200

Note :All dimensions are in meter

Scale- Plan 1:1000

L/S, H- 1:2000 & V- 1:200

	MH 12 to MH 13	1	30.00	1.00	1.50	45.00				
	MH 13 to MH 14	1	21.00	1.00	1.50	31.50				
	MH 21 to MH 20	1	35.00	1.00	1.20	42.00				
	MH 20 to MH 19	1	30.00	1.00	1.20	36.00				
	MH 19 to MH 18	1	30.00	1.00	1.40	42.00				
	MH 18 to MH 17	1	23.00	1.00	1.40	32.20				
	MH 17 to MH 16	1	49.00	1.00	1.65	80.85				
	MH 16 to MH 15	1	33.00	1.00	1.50	49.50				
	MH 19 to MH 22	1	36.00	1.00	1.20	43.20				
	MH 22 to MH 23	1	30.00	1.00	1.00	30.00				
	MH 23 to MH 24	1	30.00	1.00	1.65	49.50				
						1085.20				
	Deduction for MH's	-22	2.18	1.00	1.51	-72.42				
	As per SL No 1 (Asphalt cutting or Concrete Cutting)					-253.21				
	Earth work excavation for Lateral Linking									
		1	230.00	0.80	1.20	220.80				
						980.37	Cum	980.37	167.00	163721.86
	Same as above									
B	**2 to 4 Mtr. depth**									
	MH 8 to MH 9	1	49.00	1.00	0.05	2.45				
						2.45				
	Deduction for MH's	-1	2.18	1.00	0.05	-0.109				
						2.34	Cum	2.34	225.00	526.73
3	EXCAVATING FOR PIPE LINE TRENCHES OF REQUIRED WIDTH by mechanical / & manual means including dressing sides, ramming of bottoms, providing barricading, danger lighting, shoring,strutting, dewatering, etc. IN HARD ROCK BY CHISTELLING TO PROPER SLOPE etc. for: (SR:2017-18,P.52,SLNO.5.1CODE(A068A)									
	Pipes of all dia. for depth upto 2.0 M Note : If any shoring and strutting, will be paid separately.20%									
		1	980.37		0.20	196.07	Cum	196.07	1487.00	291562.16
	Pipes of all dia. for depth 2.0 to 4.0 Mtrs. Note : If any shoring and strutting, will be paid separately. 40% 690.53x0.3=207.15									
		1	2.34		0.40	0.94	Cum	0.94	1602.00	1500.11

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Estimate for the work of providing and laying of 300mm dia RCC NP3 class pipe line from sarakki signal to pipeline road, iliyas nagar outer ring road coming under Banashankari service station of AEESW-4 sub division to Shift the existing utilities for construction of Flyover by BBMP.

Sl.No.	Particulars	No.	L	B	D	Qty	Unit	Quantity	Rate	Amount
1	Cutting road surface forpipe line trenches and disposing									
	off the excavated stuff as directed including barricading,									
	danger lighting etc., in the following classification									
	(2) Cutting Asphalt road(SR:2017-18,P.56,SLNO.16.2CODE(A105B)									
	MH 1 to MH 2	1	14.00	1.00	0.30	4.20				
	MH 2 to MH 3	1	44.00	1.00	0.30	13.20				
	MH 3 to MH 4	1	43.00	1.00	0.30	12.90				
	MH 4 to MH 5	1	23.00	1.00	0.30	6.90				
	MH 5 to MH 6	1	30.00	1.00	0.30	9.00				
	MH 6 to MH 7	1	30.00	1.00	0.30	9.00				
	MH 7 to MH 8	1	30.00	1.00	0.30	9.00				
	MH 8 to MH 9	1	49.00	1.00	0.30	14.70				
	MH 9 to MH 10	1	38.00	1.00	0.30	11.40				
	MH 10 to MH 11	1	30.00	1.00	0.30	9.00				
	MH 11 to MH 12	1	30.00	1.00	0.30	9.00				
	MH 12 to MH 13	1	30.00	1.00	0.30	9.00				
	MH 13 to MH 14	1	21.00	1.00	0.30	6.30				
	MH 21 to MH 20	1	35.00	1.00	0.30	10.50				
	MH 20 to MH 19	1	30.00	1.00	0.30	9.00				
	MH 19 to MH 18	1	30.00	1.00	0.30	9.00				
	MH 18 to MH 17	1	23.00	1.00	0.30	6.90				
	MH 17 to MH 16	1	49.00	1.00	0.30	14.70				
	MH 16 to MH 15	1	33.00	1.00	0.30	9.90				
	MH 19 to MH 22	1	36.00	1.00	0.30	10.80				
	MH 22 to MH 23	1	30.00	1.00	0.30	9.00				
	MH 23 to MH 24	1	30.00	1.00	0.30	9.00				
						212.40				
	Asphalt Cutting for Lateral Linking									
		1	230.00	0.80	0.30	55.20				
		-22	2.18	1.00	0.30	-14.39				
						253.21	Cum	253.21	894.00	226371.53
2	Earth work excavation for pipeline trenches required width by mechanical									
	/& manual means incl dressing sides, ramming of bottoms,									
	providing baricasing.danger lighting ,shoring, strutting, dewatering, etc,									
	directed in the following strata.									
	1) In all kinds of soils mixed with boulders of 30 cms size up									
	if any shoring and strutting will be paid separately.									
A	(1) **0 to 2 Mtr. Depth** (SR:2017-18,P.51,SLNO.1.1CODE(A050A)									
	MH 1 to MH 2	1	14.00	1.00	1.50	21.00				
	MH 2 to MH 3	1	44.00	1.00	1.60	70.40				
	MH 3 to MH 4	1	43.00	1.00	1.80	77.40				
	MH 4 to MH 5	1	23.00	1.00	1.75	40.25				
	MH 5 to MH 6	1	30.00	1.00	1.55	46.50				
	MH 6 to MH 7	1	30.00	1.00	1.50	45.00				
	MH 7 to MH 8	1	30.00	1.00	1.50	45.00				
	MH 8 to MH 9	1	49.00	1.00	2.00	98.00				
	MH 9 to MH 10	1	38.00	1.00	1.80	68.40				
	MH 10 to MH 11	1	30.00	1.00	1.55	46.50				
	MH 11 to MH 12	1	30.00	1.00	1.50	45.00				

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